MACHINERY

Design—Construction—Operation

Volume 41 NOVEMBER, 1934 Number 3

Heat-Treating Equipment and Methods in an Automobile Plant **will be the subject of the leading article in December MACHINERY. The heat-treatment of the parts of the modern automobile has become one of the very most important operations in the whole process of car manufacture.**

Another article in the December number that will hold the interest of mechanical men answers the question: *Can Trade Secrets be Legally Protected?* Few men in industry know exactly what the answer to this question is. The article to be published answers it.

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CAMPAIGN CRY:-

"A FULL DI

FOR THE MAN WHO OWNS THE SHOP!

THE LODGE AND

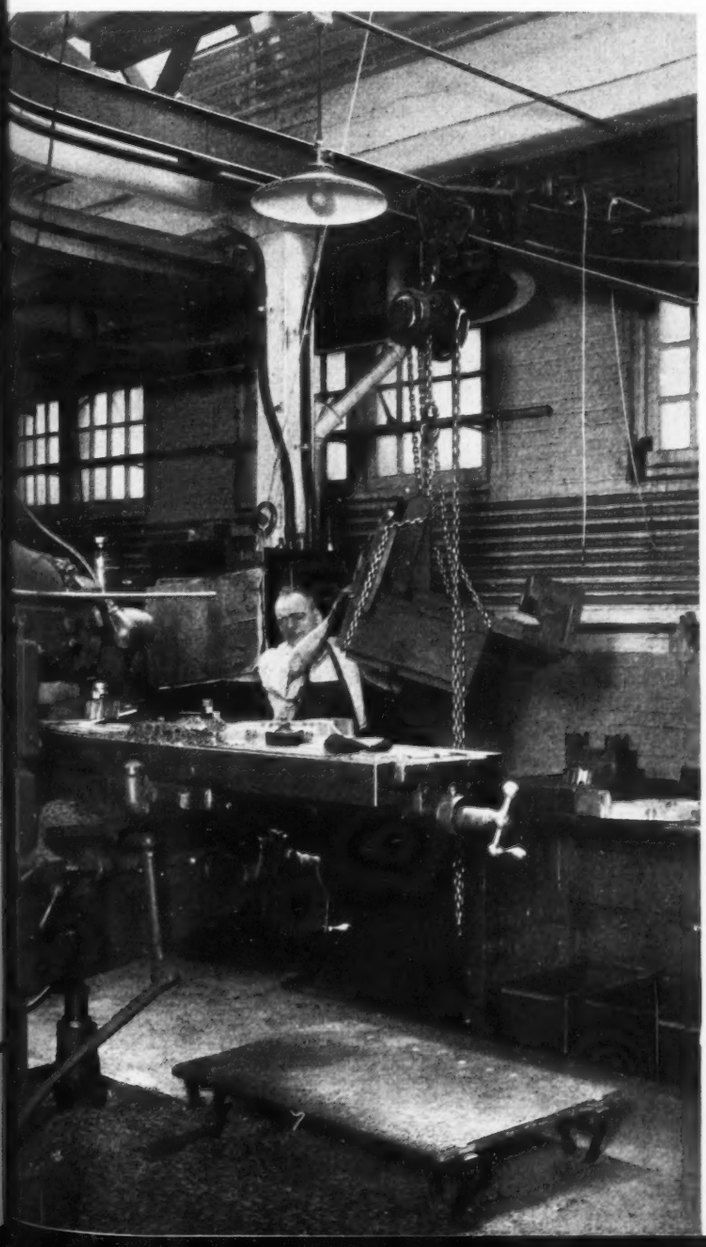
MACHINERY

Volume 41 NEW YORK, NOVEMBER, 1934 Number 3

An Equipment Manufacturer Who Practices What He Preaches

In a Well-Known Plant where Hoists and Trucks are Made, Laborious Work is Completely Eliminated by the Use of the Company's Own Products

By CHARLES O. HERB



IT is often said that manufacturers of labor-saving equipment, while constantly advocating the use of their products in other plants, frequently fail to take advantage of such equipment in their own. But one has only to take a trip through the Philadelphia plant of the Yale & Towne Mfg. Co., where materials-handling equipment is made, to be convinced that there are manufacturers who "practice what they preach," for here hand and electric hoists and trucks are found wherever their use will turn a fatiguing job into an easy one.

Time could be profitably spent in studying the work-handling methods used in this plant. Where heavy pieces are handled, machine loading time can often be reduced considerably by providing facilities directly at the machine for lifting the work.

However, the provision of a sufficient number of hoists, trucks, conveyors, etc., is not the complete answer to work-handling problems. All the work should be so routed between the various departments as to travel the shortest possible distance. It has been found that, in large plants, pieces of work sometimes travel several miles unnecessarily, simply because careful thought has not been given to the routing of the operations. Rerouting of operations, relocation of machines, and the use of up-to-date materials-handling equipment can effect large economies where such conditions exist.

Hoists can frequently be employed in machine shops to save time and eliminate hard labor in placing heavy jigs, fixtures, cutters, or work on machine tools. In the machine shop of the Yale & Towne plant, spur gear hoists of 1/2 ton capacity are provided for this purpose at all large radial drilling machines and milling machines. The heading illustration shows a typical installation.

Fig. 1. Heavy Steel Plates are Conveniently Unloaded from Railway Cars by an Electric Hoist Mounted on a Jib Crane

The overhead I-beam track in this installation is equipped with a switch and spurs that enable heavy fixtures and cutters to be brought from points either to the right or left of the machine along the wall. A similar overhead track, which cannot be seen in the illustration, but which is located at right angles to the machine table, is provided with another hand hoist for carrying the work to and from the machine. With such an arrangement, machine operators are never injured by lifting heavy loads. The time saved in setting up, loading, and unloading the machine soon paid for the hoist equipment.

Steel Plates are Ordinarily Cumbersome to Handle

Steel plates are used extensively in this plant for fabricating the frames and housings of the hand and electric trucks, which comprise a large part of the plant's output. The steel plates are delivered to the plant on a railroad siding, erected high enough on the outside of a building to bring the floor of the railway cars on a level with the second floor of the building. They arrive on gondola cars, such as are seen in the foreground of Fig. 1. They are usually 12 feet long by 4 feet wide. Many of them are 1/2 inch thick and weigh approximately 1000 pounds.

Plates of this size and weight would be cumbersome if unloaded from the cars by hand. To facilitate unloading, a jib crane has been erected, as shown in the illustration. On the boom of this crane is a one-ton electric hoist that is employed to lift the plates from the cars and drop them through a long narrow opening in the wall of the building, directly to the first floor of the shop.

This hoist is easily controlled by means of a push-button switch, held in the right hand of the operator. A container attached to the hoist catches

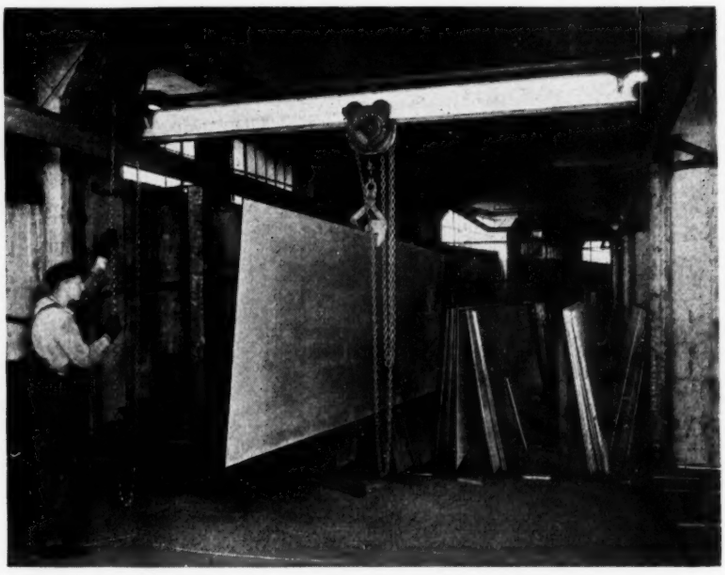


Fig. 2. A Hand Crane Equipped with a Hand Hoist Facilitates Storage of the Steel Plates Vertically on Racks

Fig. 3. Three-ton Hoists and an Electric Tractor Remove Incoming Bar Stock and Supplies from Trucks

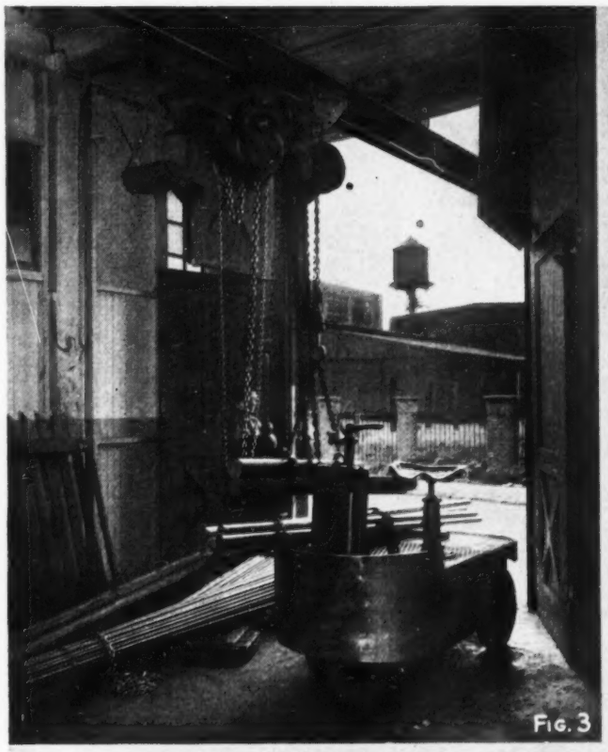
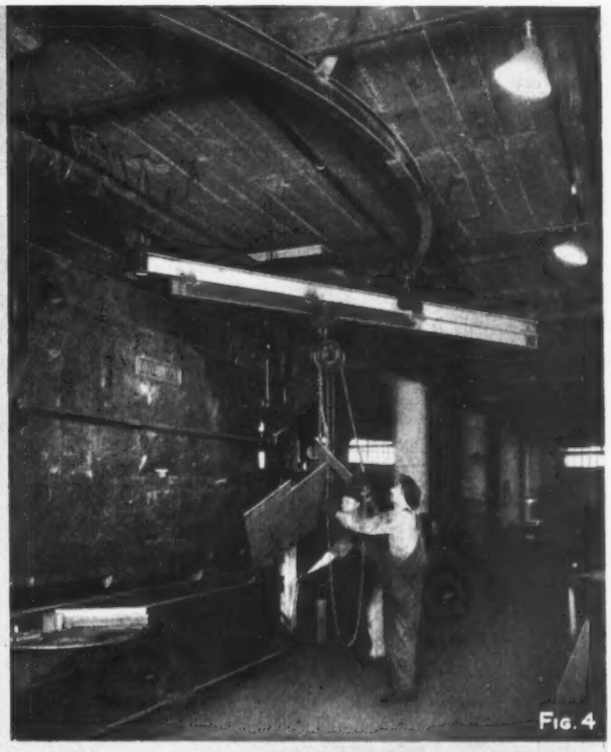


Fig. 4. A Trolley-supported Swinging Boom and a Hand Hoist Aid in the Operation of a Large Press Brake



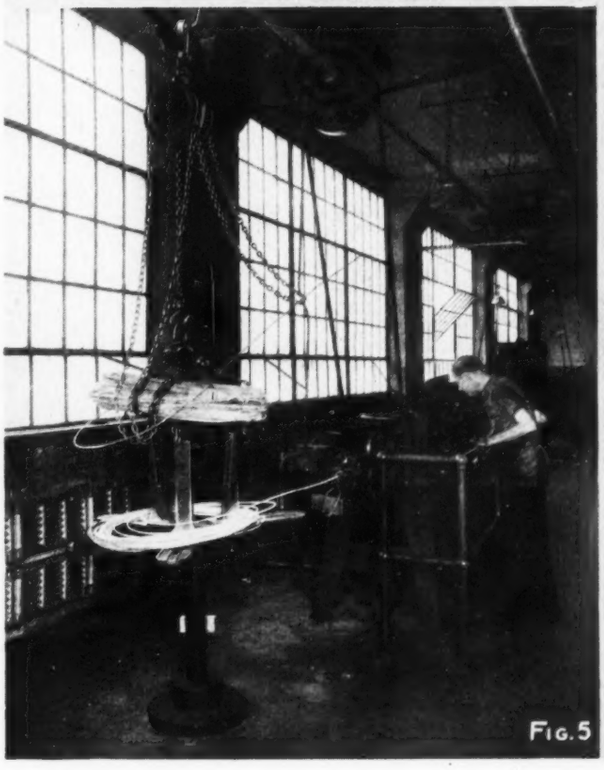
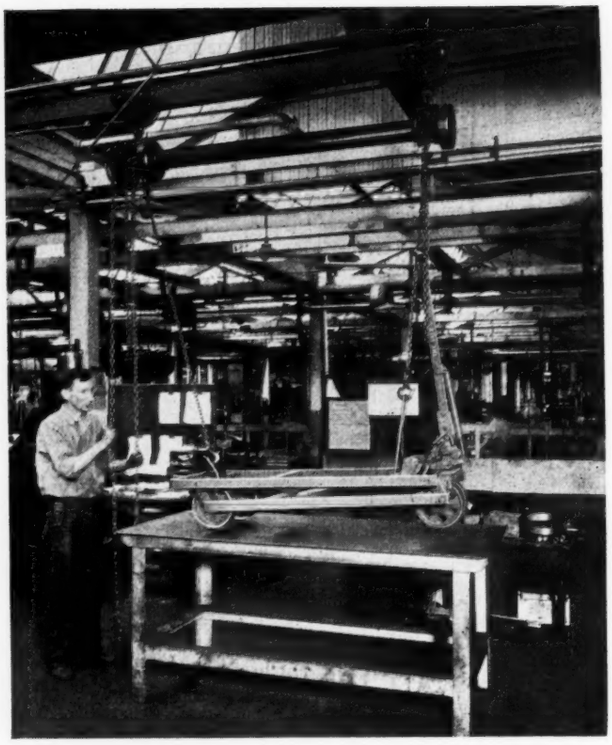


Fig. 5. Hoists are Used to Bring Coils of Wire to Chain-forming Machines and to Load Reels

Fig. 6. Three-hundred Foot Lengths of Hand Chain are Loaded into Tumbling Barrels with Ease

Fig. 7. The Use of a Twin Hoist Facilitates the Assembly of Hand Lift Trucks, which is Accomplished on Tables, as Shown



the slack chain, so that it does not hang down and interfere with hoisting. Oil-saturated waste in the bottom of the container keeps the chain from rusting, while a sheet-metal cover protects the hoist from the elements when it is not in use. This hoist has been in service for more than three years without requiring any extensive repairs.

The receiving room for the steel plates is shown in Fig. 2. Here a hand crane equipped with a hoist of one ton capacity has been furnished for conveniently stacking the plates vertically on racks and for withdrawing them as required. The plates are lifted by an automatic gripping device suspended from the load hook of the hoist.

Raw materials for the machine shop are received mainly at the doorway shown in Fig. 3. This entrance to the shop is provided with an overhead I-beam track which projects several feet outdoors, so that two hoists can be pulled above motor trucks for unloading bar stock, castings, or other incoming supplies. Both hoists are of three tons capacity. The electric tractor seen in this illustration is used to carry the raw materials to the stock-room. Electric trucks shipped from the factory by motor trucks are also loaded from the doorway in Fig. 3.

Hoists that Lighten Additional Machine Operations

Attention has already been called to the use of hoists in the machine shop for reducing physical labor in the operation of radial drilling machines and milling machines. Fig. 4 shows an unusual hoist arrangement that has reduced fatiguing labor in the operation of a large press brake. A swinging boom pivoted at the ceiling in front of the brake is supported at its outer end by two trolleys, linked together by a clevis. One of these trolleys runs on a curved I-beam that is also fastened to the ceiling, while the other runs in and out on the swinging boom, automatically adjusting itself to suit the angular position of the boom.

On the boom is a 1/2-ton hand hoist by means of which steel plates are lifted and held in the required position while they are being formed into truck frames and housings. The boom is swung around by merely pulling sidewise on the hoist chain.

Hand chain for hoists is formed complete from coiled stock in one operation by machines of the type shown in Fig. 5. Load chain is produced from straight lengths of wire and welded into links after they have been tumbled. The coils of wire from which the hand chain and the load chain are produced weigh from 100 to 150 pounds apiece and would ordinarily require the services of two men if they were loaded by hand on

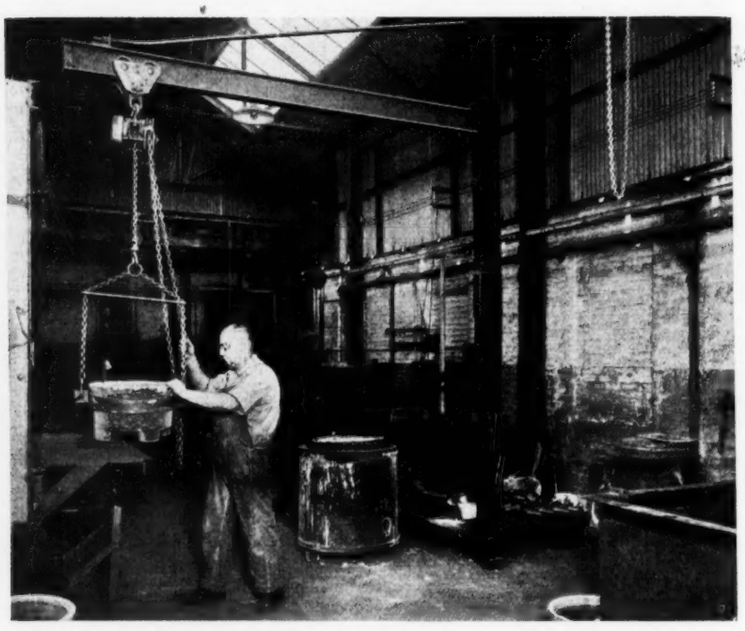


Fig. 8. A Jib Crane and Hand Hoist Have Greatly Reduced Fatiguing Work in the Heat - treating Department

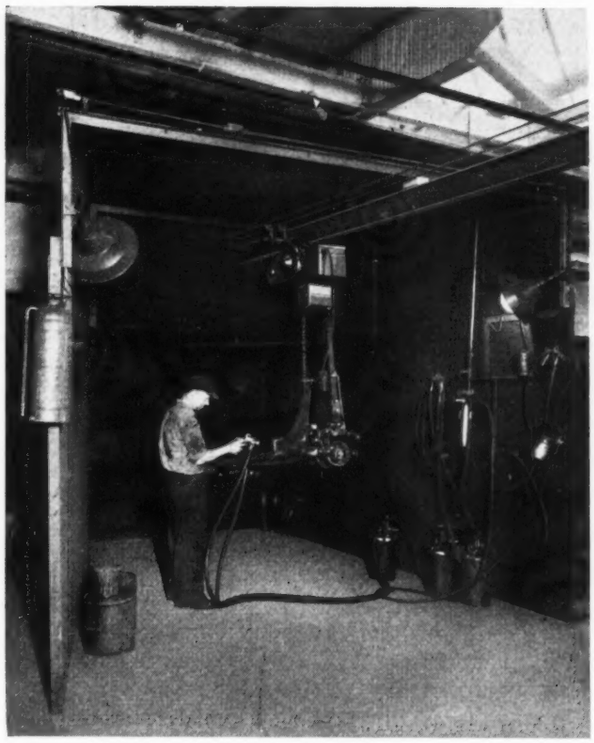


Fig. 9. Paint-spraying of Hand and Electric Trucks—Another Job that is Made Easy by the Use of an Electric Hoist

the reels of the cutting-off and chain-forming machines. Instead, a 1/2-ton hoist, suspended from a trolley and overhead track, is provided, which enables the operator of each machine to bring coils from the adjacent storage point and load them conveniently on the reel.

Hand chain is formed in lengths of about 300 feet and cut off to suit requirements after the chain has been tumbled. These lengths of chain weigh approximately 175 pounds. They are brought in box skids to the tumbling barrels seen in Fig. 6 by means of a hand lift truck. A one-ton hoist makes it easy to load the chain into the tumbling barrels and remove it. This hoist is attached to a trolley that rides on an I-beam track and serves five barrels.

The short lengths of straight stock that are later formed and welded into load chain are loaded into tote boxes and brought to the tumbling department by a hand truck. The tote boxes weigh about 200 pounds each when loaded. They are emptied conveniently into tumbling barrels by applying another hand hoist. All together, there are nine tumbling barrels in the department.

Back-breaking jobs are frequently encountered in heat-treating departments. However, in the heat-treating department of the Yale & Towne plant, jobs of this nature have been eliminated through the provision of work-handling equipment. For example, the jib crane and hand hoist seen in Fig. 8 facilitate the loading of heavy individual pieces or pots of small parts into furnaces and their removal while hot. The crane and hoist can also be used to dump the work easily into adjacent quenching tanks.

A Twin Hoist Aids in the Assembly of Hand Trucks

Hand lift trucks are assembled on tables of the construction illustrated in Fig. 7. During the assembly of a truck, it is necessary to transfer it from table to floor. The twin hoist seen in the illustration has proved particularly satisfactory for this service and for carrying the completely assembled truck to a painting booth, because it provides for suspending the truck from both ends.

This twin hoist is made with only one set of spur gearing but with two load sheaves and chains. Instead of the gear-case being a single unit at the end of the hoist where the hand chain is located, part of the gearing is located at the far end of the hoist, so as to equalize the stresses at the two ends. The span between the sheaves is approximately 6 feet.

The twin hoist just described delivers the assembled hand trucks to the painting booth shown in Fig. 9, where they are picked up by an electric hoist of 1/4 ton capacity which carries them into the booth and holds them suspended for spray-painting. A push-button control enables the operator to

Fig. 10. Most of the Heavy Hauling and Stacking in the Plant is Accomplished by Means of an Electric Truck

raise and lower the truck conveniently for painting underneath, on top, or at any angle. Electric current for operating the hoist is taken from the two overhead wires that may be seen above the I-beam track. This track is also equipped with a container that catches the slack chain so as to protect it from the sprayed paint and insure its constant lubrication.

In cases where a truck must be suspended from both ends while being painted, a one-ton hand hoist is suspended from the same track as the electric hoist to serve in an auxiliary capacity.

Two Electric Trucks Serve the Entire Plant

An electric truck of the high-lift type suffices for transporting most of the heavy work to the different departments and to the shipping points, even though the plant has a total area of 195,000 square feet in active production. Eighty-five per cent of the activity of this truck is confined to the shipping and receiving departments. The truck is shown in Fig. 10, ready to remove a steel box skid loaded with chain from an inspection bench. The same truck is used to load boxes of finished hoists and trucks directly on freight cars from the doorways seen in Fig. 1. It is also used for stacking boxes of loaded scrap, raising heavy dies to machine tables, and lifting motors for installation on machines or on overhead beams.

Hand lift trucks are employed throughout the plant for conveying lighter loads between machines and departments. The tractor shown in Fig. 3, in addition to being used for receiving bar stock and other raw materials, is also employed for pulling electric trucks that have not been equipped with batteries to shipping points and for general emergency service.

Complete records are not available as to the actual savings in dollars and cents that have been made at the Yale & Towne plant through the application of hoists and trucks, but great economies have been effected by the complete elimination of hard physical labor.

* * *

The Foundrymen's Association Meeting in Philadelphia

At the annual meeting of the American Foundrymen's Association held in Philadelphia, Pa., October 22 to 26, a large number of papers dealing with almost every phase of the foundry industry were presented. Individual sessions were devoted to steel castings, gray-iron castings, malleable cast iron, non-ferrous castings, cupola practice, refractories, materials handling, and foundry apprentice training. In conjunction with the convention, an extensive exhibition was held in the new Convention Hall covering foundry equipment, products, and methods.

Finding Diameter of Cylinder from Measurement of Arc—Comment

By WILLIAM S. ROWELL

Referring to the device described on page 743 of August MACHINERY, many similar devices have been made, used, and described, all depending on computing the required diameter from the available chord and its rise. The methods of computation vary. Of them I will only say that by far the simpler are related to a device that is in tangential contact with the work like a V-block; and as such a device is easier to produce accurately and will retain its original accuracy indefinitely, it is much to be preferred.

It is obvious that the greater the arc subtended by the contact points, the greater the accuracy of the result. If it is 90 degrees, fairly accurate results are possible. If it is 60 degrees, reference to tables of trigonometrical functions show that nothing less than the most refined laboratory methods, both in producing and in using the instrument, will secure even ordinary machine shop accuracy. Writers have claimed that a 4-inch chord (and its rise) of an 8-inch circle can be measured with such a device and accurate results obtained. As a 4-inch chord of an 8-inch circle subtends an arc of 60 degrees, its rise is 0.5358984 inch. The rise of a 4-inch chord of an 8.010-inch circle is 0.5365683 inch. The difference is only 0.0006699 inch. Thus it is seen that an error of 0.0005 inch in measuring the rise would lead to an error of about 0.007 inch in the diameter. It should be emphasized that the difficulties presented in producing such a device accurately are only exceeded by the impossibility of maintaining knife-edge contacts or of discovering and correcting their rapid wear.

* * *

Household Device Serves as Thumb-Tack Lifter

By FRANK W. BENTLEY, JR.

Although a large number of commercial and home-made devices are made for lifting and removing tacks from drawing-boards, it often happens that none of these devices is available when wanted. A very handy and practical tool for this job is the lid or cover lifter commonly supplied for removing the lids or covers from friction top cans. Such lifters can be obtained at grocery stores. Wholesale canning companies also furnish them with the cans in which their products are sold. The spoon-like lip can be dressed and sharpened with a file if necessary. Thus prepared, it readily lifts any tack without scratching or marring the cloth or paper, and does not roll down an inclined table, as do many of the round-handled devices used for this work.

Art in Engineering Design

By G. L. SCHWARZ, Industrial Designer, Cleveland, Ohio

ART is rapidly becoming a branch of engineering. Just as the present zoning laws have given birth to our modernistic setback type of architecture, so the idea that beauty is a true function of utility will force the engineer more and more into assuming a "design for appearance" attitude.

Apart from its obvious sales advantages, a trim, efficient looking, and well proportioned piece of machine equipment arouses the pride of its operator. The effect is reflected in his production rate, and, what is equally important, in the care that he takes of the machine.

Why, then, should there be any ugly designs, especially when ugliness is expensive? There are several reasons: (1) A two-dimensional drawing cannot convey, even to its designer, an accurate conception of the proportions of the design or its final appearance in a three-dimensional product. Nor does it allow finishes, color combinations, etc., to be visualized. (2) Actual models are too expensive to allow the average small-production shop to do much experimenting along the time-honored cut-and-try methods. (3) The average engineer does not make use of the essential tool which would enable him intelligently to incorporate attractive appearance in his mechanical structures. That tool is perspective.

Tradition says that the ability to create beauty is a gift bestowed only upon a chosen few whom we call "artists." Logic refutes this, because beauty exists only by virtue of its acknowledgment by the majority. Therefore, artists are distinguished from the majority only by their ability to use the tools of their craft. Perspective offers a mathematical and precise method by which the engineer can create beauty, which, after all, is merely an intelligent adaptation of a current trend.

A thorough knowledge of perspective adapted to product design will enable the engineer (1) to eliminate preliminary model-making of stampings, castings, machined parts, etc. (This, of course, does not apply to mechanisms.) (2) To feel out the market at little expense. (3) To experiment with his design, since any changes on the perspective drawing can be transferred easily to the production drawing. (4) To try out color combinations and finishes at an almost negligible cost. (5) To get the reactions of his employers, of the salesmen, and of potential customers. (6) To produce a sales picture before a great deal of money is spent on production.

Take, as an example, the procedure in developing a machine tool design. By experiments and previous experience, the practicability of the functioning mechanism is ascertained, and the basic and definite dimensions of the functional design of the machine are established. These include shaft spacing, inside dimensions of oil basins, working height of machine, etc. This skeleton is then inked in.

The remainder of the machine is now drawn tentatively in pencil, after which a perspective is made with mathematical accuracy. The engineer now has a picture that offers something tangible to present to the sales department and the executive of his concern for their criticisms and suggestions. After all the desired changes have been made on the perspective drawing, they can be projected back on the original mechanical drawing, offering a double check on the design.

It must be kept in mind that isometric projection is useless for accurate visualization of designs. A true perspective, utilizing mathematically correct vanishing and eye points, *must* be used. There are numerous perspective systems, but very few are suitable for complicated mechanical designs.

If a sales picture is required, it is a simple matter to have the perspective drawing painted in to resemble a retouched photograph, with the assurance that the finished machine will look exactly like the picture. Photographs of this picture or painting will enable the engineer to experiment with color combinations and finishes. For the coloring, any standard make of photographic water or oil tint can be used. To retouch different finishes on the original photograph is usually a job for the airbrush artist.

* * *

Accurate Costs Increase Profits

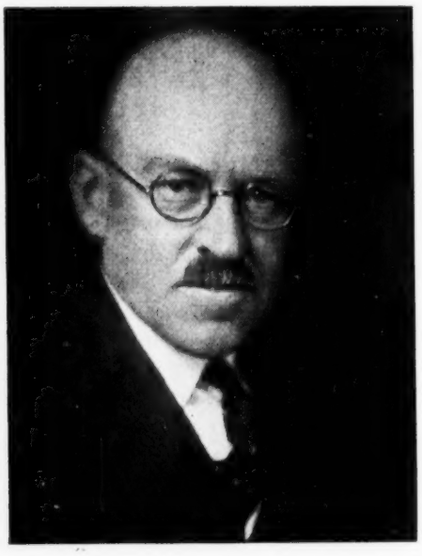
Reliable information as to gains or losses in the operation of the various divisions is invaluable to the manufacturer who makes a variety of products. It is a common experience, when cost-engineering methods replace old formulas, to find that some products have been highly profitable, while others have absorbed the gains, making the business as a whole unprofitable. The wise manager, learning this, immediately sets about to apply a remedy, and very generally finds it possible to substantially increase his profits without necessarily increasing the volume of his business. The distribution of generalized expense groups is often responsible for unprofitable conditions commonly charged to the unethical practices of competitors.—*Robert Scudder Denham*

Ralph E. Flanders, New President of the American Society of Mechanical Engineers

RALPH E. FLANDERS, president of the Jones & Lamson Machine Co., Springfield, Vt., has been elected president of the American Society of Mechanical Engineers for the year 1935. Mr. Flanders will take office during the coming annual meeting of the Society early in December.

Mr. Flanders was born at Barnet, Vt., September 28, 1880. After graduating from the Central Falls, R. I., High School, he served an apprenticeship with the Brown & Sharpe Mfg. Co., later gaining additional experience in machine design and shop practice with the Taft-Peirce Mfg. Co., the International Paper Box Machine Co., and the General Electric Co.

He was then, for four years, associate editor of MACHINERY, after which he became sales engineer with the Fellows Gear Shaper Co., and, subsequently, manager of the Fay lathe department of the Jones & Lamson Machine Co. In 1914, he was made manager, and in 1933 president, of the Jones & Lamson company.



Ralph E. Flanders, Newly Elected President of the American Society of Mechanical Engineers

Mr. Flanders early became interested in the design of gearing and methods of cutting gears, and in 1908, published a book "Gear-Cutting Machinery." Later he turned his attention to the problems of screw threads and thread grinding, and developed a successful method for the precision grinding of tap threads; he also patented improvements in tap thread design.

In addition to his writings on engineering subjects, Mr. Flanders is one of the best known authors on the broader aspects of management and economics in the engineering field. His book "Taming Our Machines," published in 1931, is a real contribution to the literature on economic subjects, especially valuable because of its clear statements of facts at a time when economic thinking generally is extremely confused. His discussions on industrial and economic problems have appeared in a wide range of magazines, both in the general and in the engineering fields.

Few men have given as much time and thought to the welfare of their profession as has Mr. Flanders. He has served on a great number of committees of the American Society of Mechanical Engineers. For several years he represented the Society on the National Screw Thread Commission. He was elected a member of the Council of the Society in 1926, and served in this capacity and in the capacity of vice-president until the end of 1931. He has also been a delegate of the Society to the American Engineering Council, and has been active in the Public Works program of the Society.

In 1924, Mr. Flanders served as president of the National Machine Tool Builders' Association. At that time his presidential address dealt with current economic problems. He pointed out the importance of the transition from the economics of need to the economics of plenty—a contribution of great importance to economic thinking. His economic studies and writings have brought him to the forefront of leadership in his field.

Upon the passage of the National Industrial Recovery Act and the organization of the National Recovery Administration, Mr. Flanders was called into service as a member of the Industrial Advisory Board. He is also a member of the Business Advisory and Planning Council appointed by the Secretary of Commerce.

His interest in educational matters is second only to his interest in engineering and economics. He is a lecturer at the Tuck School of Business Administration at Dartmouth College and is a frequent speaker before groups of economists, engineers, and industrialists.

Mr. Flanders has received many honors because of his outstanding services to his profession. In 1932, Stevens Institute of Technology awarded him the degree of Mechanical Engineer. The same year, Dartmouth College awarded him the degree of Master of Arts. In June, this year, he was honored with the degree of Doctor of Science by Middlebury College, and Doctor of Engineering by the Brooklyn Polytechnic Institute.

What is Ahead in the Machinery Industries?

Abstract of a Report Presented to the National Machine Tool Builders' Association by Herman H. Lind, General Manager of the Association

EVEN though business today is in the midst of the greatest uncertainty it has probably ever experienced, it is well to remember that uncertainty is not entirely new. Business as a whole, and individual units in business, will always have their problems and uncertainties. It is chiefly a matter of degree, coupled at present with the general depression, which has cut more deeply and has extended over a longer period than those that have gone before.

In addition to the economic factors involved, we have the difficulty at this time that is brought about by the tie-up of government and industry. The political viewpoint naturally adopts a social slant, which frequently is emphasized to such an extent that real progress is retarded by proposals that are impracticable.

The greater degree to which unknown factors harass industry today should not interfere with an attempt to find the probabilities, and to study and analyze the effect of those probabilities. Industry was receptive to the aims of the National Industrial Recovery Act, namely, to put men to work and to eliminate cut-throat competition, because the men directing industry were as anxious to give employment to those who wanted to work as anyone else; they have also demonstrated in years gone by that they have real courage in the face of competition. In many industries, the great majority of the individual businesses have succeeded under the banner of fair competition. It is refreshing to go back to the early part of this century, before the advent of the Federal Trade Commission and the cataloguing of fair trade practices under codes, and observe the high character of the business principles which were customary in many industries.

Many of these industries continued to follow these high principles into and through the depression. Unfortunately, however, in most industries there were some, at first possibly just a few, units that departed from fair practices both in their sales work and in their employment relations. The action of these few had the effect of bringing about reprisals—"cut-throat competition" it is called—and in many cases, the burden was then thrown upon the wage earner. It was the attempt to remedy these conditions that brought about the National Industrial Recovery Act.

The Recovery Act was an emergency measure and therefore has a two-year limitation. The effort to codify industry quickly, in order to get as much advantage out of the two-year period as possible resulted in many provisions being put into codes that should not be there. It is generally admitted that these provisions cannot become permanent; but industry is not safe in planning its future with the expectation that all the features of the National Industrial Recovery Act will be eliminated. It is faced with the need for making its plans subject to the retention of the Recovery Act, or something comparable, and for considering what provisions are likely to remain.

The labor provisions take the first place in probability of survival—surely some type of collective bargaining. The minimum wage is very certain to remain, because it is felt that that is the only protection against sweat-shop operation. Maximum hours will undoubtedly stay in some form. In our industry, which is so dependent on skilled workmen, limitation of hours and restriction of flexibility of plant operation will bring almost insurmountable obstacles in operation when recovery returns. In this industry, there is a shortage of skilled workmen, as compared with 1929, and there was no surplus then. Continuity of production is always dependent upon skilled workmen, not only in our own plants but in the plants of our customers.

Effect of Hour-and-Wage Provisions on the Demand for Machinery

The forty-hour week is quite general. It represents a cut in hours of more than 20 per cent. Industry has not digested nor made practical that shortening of hours; it has had no opportunity to do so and to go further would make it impossible to maintain the present standard of living. Reasonable and intelligent flexibility of hours of work is an absolute necessity, if efficient plant operation is to continue. Excessive hours can be discouraged by accelerating rates of payment for overtime.

There is another result of the higher wages and shorter hours that is beginning to be apparent in our industry. Higher wages and shorter hours make necessary cost-saving equipment wherever it can be used. That this is taking hold is well illus-

trated by sales of machine tools this summer. It is particularly noticeable in the sales for August. Whereas during the month the general business went down 7 per cent, the increase in machine tool sales over July was 20 per cent. An analysis discloses that 53 per cent of the companies in our industry increased their business; so it is plain that this was not the result of a chance order or two.

Those machines in which substantial advance in productivity has been made in the last few years are in demand, and especially those that are used in the mass production of such articles as automobiles, refrigerators, washing machines, and the like. The consumer goods industries have found that sales of their products are promoted more by low price than by anything else, and that low price under the hour and wage restrictions is only possible through the best methods of manufacture. Even in the face of general uncertainty, the rugged individualism under which our country flourished is beginning to reassert itself, and a great number of industrialists are struggling to go forward in spite of every obstacle.

It is evident that the shortage of skilled workmen which will be brought about by any reasonable recovery will become acute immediately. There probably is no other matter that is so deserving of the immediate consideration, action, and planning on the part of the individual shops. Undoubtedly some of the workmen who have left the industry will be back when they have the assurance of a steady job, but this will not be nearly enough. Plans for training men must be ready to be put into operation the moment it is possible.

Fair Trade Practice Provisions are Here to Stay

Other code provisions that may be retained in some form are the price provisions and fair trade practices. The relation of these is such that they can properly be considered together. One cannot look at the "Principles of Business Conduct" adopted by the National Machine Tool Builders' Association in 1928 without experiencing a feeling of sincere admiration; these principles are the background of the fair trade provisions written into the code.

It seems probable that in some agency or other at least a minimum of rules of good business conduct will be laid down in an enforceable way, so that those units of industry that follow fair business practices will not be victimized by those who do not. I believe, therefore, that either through codes, through the Federal Trade Commission, or through some other instrument, the fair trade practices will take some substantial form and substance, at least for those industries that want them.

Probably the most important attempt at fair trade practices is that which is generally found in codes and is most desirable to industry, namely, the open, firm price policy. It is regrettable that the fundamental difference between "open, firm price policy" and the "fixing of prices" is not understood, and that they are treated by newspaper writers as one and the same thing. There are others also who do not differentiate between "open prices" and "fixed prices"; there is misconception within the NRA itself, and even among business men.

Provisions Restricting the Use of Efficient Equipment Must Go

Some of the codes provide for restrictions of new equipment and restriction against expansion, except as it may be subject to the approval of the code authorities and the administrator. Provisions of this type certainly should not be included in any form. New methods, new processes, throwing out of the inefficient and the wasteful are demanded if progress is to be made. If a man has a better idea for a low-cost production, no legal obstacle or difficulty should be put in his path. However, there should be available to him the statistics of the industry showing the true condition existing as to capacities and the competitive situation in the market. With this picture available to those willing to invest their money, it is right, and in the public interest, that they should be able to go forward. Otherwise, whole industries using obsolete equipment and practicing inefficient methods would remain in that condition indefinitely, contrary to all fundamental principles of progress. The best safeguard against unwise investment in additional capacity is sufficient knowledge of the situation surrounding a given industry.

To sum up, it would seem to be the part of wisdom for business men to make their plans with the expectation that present labor provisions or something akin will prevail, and that there will be a certain amount of fair trade practice provisions, with increasing attempts at enforcement. It is almost certain that price fixing will not be tolerated, but possibly there will be a better understanding of the nature of open price plans, and these may be sanctioned. There is very certain to be a demand for more statistical information to show the condition of the various industries. The machine tool industry costs may be expected to increase, and this might take place very rapidly with any substantial increase in business. Lastly, let it be emphasized that it is an absolute necessity that individual business men present their problems and their needs to their legislators, and do so persistently.

* * *

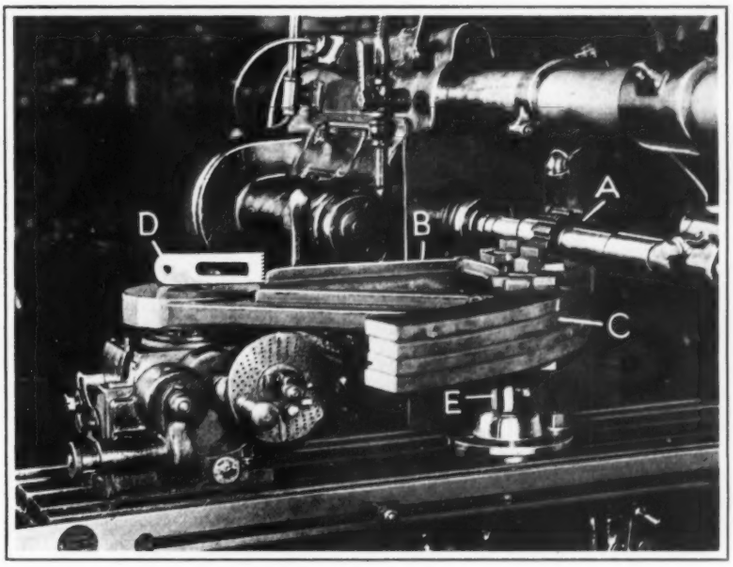
What a contribution engineering could make to a better codification and understanding of economic laws! The whole field of political economy is badly in need of the services of the engineer type of mind, with the objective and scientific approach to problems, its contempt for loose talk, and its hunger for facts.—*James D. Mooney, Vice-President of the General Motors Corporation*

Milling the Teeth of Throttle-Lever Quadrants Nine at a Time

By OLIVER HERBERT

The teeth of locomotive throttle-lever quadrants and latches are milled nine at a time in the Battle Creek, Mich., shops of the Grand Trunk Railway System by employing a cutter of the thread-milling type seen at *A* in the illustration. This cutter has nine rows of annular teeth, of 12 diametral pitch.

The quadrants are produced from steel rings which are machined all over to the desired diameter, thickness, and width in a boring mill and then cut into four equal sections. These sections are mounted together on arm *B* for the tooth-cutting operation, being attached to the outer end of the arm, as indicated at *C*. This permits of cutting the teeth in four quadrants in one operation to match the teeth of latches, such as illustrated at *D*. Arm *B* is screwed on the spindle of a dividing head. The front end of the arm is supported by a large roller attached to the top of stand *E*.



Multiple Type Cutter Milling Nine Teeth Simultaneously in Four Locomotive Throttle-lever Quadrants

Nine teeth are cut in the quadrants each time the milling machine knee is fed upward to carry the work past the cutter. At the end of each upward movement, the quadrants are indexed accurately by means of the dividing head to bring a new portion into line with the cutter for the next upward movement of the knee.

This cycle is continued until teeth have been milled all around the quadrants, except for a distance of 4 or 5 inches on one end. This end is later bent to a right angle to the quadrant proper, as required to provide for mounting in the engine cab.

Although the milling cutter is straight and the quadrant curved, which, of course, introduces an error in the teeth, the inaccuracy is too slight to be considered. The former practice was to mill one tooth at a time in the quadrants and latches; obviously, the present method has reduced the machining time to about one-ninth of that formerly required.

Portable Oxy-Acetylene Machine Simplifies Metal Shaping Jobs

Applications of the oxy-acetylene cutting process described recently in *Oxy-Acetylene Tips* indicate the adaptability and versatility of a recently developed portable cutting machine. This machine has been designed especially for use in the intermediate realm where the utility of the hand apparatus leaves off and the greater scope and precision of the stationary cutting machine begins.

In trimming and beveling plate sections to be assembled into the shell of a spheroidal gas-holder, a compound-curve cut was necessary, because the plate was not only curved in two directions—similar to a wall section cut from a ball—but the angle of the edges varied in some cases. Ingenuity in making the guide for the portable cutting machine and in changing the angle of the blowpipe to suit the bevel of the edges solved this difficult problem and resulted in a faster and more economical method than that previously employed.

In another case, a company secured the job of cutting off part of the flange on 20-foot channel irons, which involved about 6700 linear feet of cutting. Each cut was required to be 20 feet long and to be accurate. A jig devised to guide the cutting blowpipe was made as follows: A 22 1/2-foot I-beam was set up on its side and a flat strip of steel secured between the edges of the two flanges by means of tack-welding. This flat steel plate provided a track or runway for the portable cutting machine. On the side of the beam against which the channels were to be cut, an arrangement of two channels was made up and welded to the flat web. With this fixture, it was a simple matter to put a channel in place, clamp it tight, and start the cutting operation.

* * *

An Italian proverb says: "He who knows, does not act; he who acts, does not know; and so the world goes all wrong."

Automotive Engineers Discuss Cutting Oils, Broaching, and Balancing

At the Detroit Production Meeting of the SAE Not Only Shop Practice but the Effect of Present Governmental Policies on Machinery Purchases was Considered

At the production meeting of the Society of Automotive Engineers, held at the Book-Cadillac Hotel, Detroit, October 10 and 11, four outstanding papers were presented on subjects that are of extreme importance in the machinery industry at the present time. W. B. Huffman, chief chemist of the Chevrolet Gear and Axle Plant, Detroit, Mich., presented a paper entitled "Cutting Lubricants and the Fundamental Considerations in Their Selection." In preparing this paper, the author was assisted by C. B. Harding of the Sun Oil Co., Philadelphia, Pa., and W. A. Oldacre of D. A. Stuart & Co., Ltd., Chicago, Ill.

Balancing problems in automotive engineering were dealt with in a paper prepared by T. C. Van Degrift and J. M. Tyler, of the General Motors Research Laboratories, Detroit. E. S. Chapman, of Chrysler Motors, Detroit, read a paper on "Production Experience with Surface Broaching," and J. E. Padgett, assistant general manager of the Spicer Mfg. Corporation, Toledo, Ohio, dealt with the subject "Machinery and Equipment Policies in View of the Present Business Situation." The latter paper is abstracted on page 161 of this number of MACHINERY.

The Need for More Information on Cutting Oils

In the paper on cutting oils, presented by Mr. Huffman, the need for a more thorough study of cutting oils was emphasized. The author called attention to the fact that one frequently finds, even in large shops equipped in the most modern fashion, a lack of information on the proper use and purpose of cutting lubricants. Too often experience and shop tradition are the sole guides in the selection of cutting fluids.

The author briefly reviewed the types of cutting oils available and their application, and pointed out the inestimable value of a classification of cutting oils, together with systematic data pertaining to their application, in simplifying plant operation. "Oil engineers recognize this fact and the more progressive oil companies would welcome," the author said, "a more rational simplification of cutting-oil classification."

There is need for a great deal of investigation in regard to the application of cutting oils to mass production operations. With the knowledge at present available to operating engineers, it is not easy to select a satisfactory oil for specific work. The author also referred to the need for placing somewhere in the cutting-oil circulating system facilities for the removal of metal particles and abrasives.

Balancing Problems in the Automotive Field

In the paper dealing with balancing problems, the authors reviewed the principles of both static and dynamic balancing; briefly outlined the essential elements of balancing machines; presented a few of the fundamental mathematical formulas pertaining to the solution of balancing problems; and gave a list of the "balance limits" accepted in good automotive practice.

In the opinion of the authors, the requirements of a good balancing machine are that it must be sensitive enough to indicate the unbalance with an accuracy of less than one-fourth of the balancing limits, plus or minus; the reading of both amount and location of the unbalance should be immediately indicated when the machine is started, so that high production can be obtained; the unbalance should be indicated without the necessity of adjusting the machine for each part being balanced; the part being balanced should not be distorted due to high-speed whip; the operation of the machine and the reading of the unbalance should be simple enough to allow an inexperienced man to learn to use the machine in a few minutes; the complete reading of unbalance should be taken without removing the part from the machine; the handling of the shaft in putting it into the machine and taking it out should be simple and easy; and it should be possible to check the balance of the part in the same machine as is used to read the unbalance. There are many other important items to be checked over, but these are the main requirements.

Progress of Surface Broaching

In his paper on surface broaching, Mr. Chapman recorded actual production experiences, including work done on single-stroke machines, on duplex type machines having two broaches working alternately in the same machine, on machines carrying two or more broaches, all of which act together at the same stroke, and on continuous rotary machines where no time is lost in handling the work.

The paper was characterized by the complete detail given with regard to each example of broaching. The material, the limits required, the amount of stock removed, the type of machine and broach used, the method of operation, the broach cost, and production were all completely outlined for a number of specific cases. These experiences, based on the production of sets of parts for several hundred thousand cars, should provide dependable data for men contemplating the use of broaching equipment.

One point emphasized by the author was the need for broaching machines of ample size and capacity for the work to be done. It is false economy to try to do the work on a machine the capacity of which may not be adequate for the job. In an effort to keep the required investment as low as possible, this mistake is sometimes made, but is decidedly poor business. Very rigid fixtures, free from spring and chatter, and positive means of holding the part are also of vital importance.

Good Lighting in Machine Shops

The three photographs below show different conditions of lighting and vision in machine shop work. The photographs, taken by the Westinghouse Lamp Co., were reproduced without retouching. To the left is shown the use of bare lamps for local lighting purposes. This has always been recognized as an objectionable method of lighting in industry, yet it is still altogether too prevalent. Light is wasted and the direct glare soon tires the worker's eyes, wearing down individual working efficiency and affecting over-all labor efficiency.

The photograph in the center shows the use of bowl type reflectors, which are available in many sizes and which offer means of obtaining correct local lighting that utilizes all of the light economically. This method also removes the direct glare which endangers the vision of the machinist. Note that the light is directed to a confined area on the lathe. By placing local lights from 3 feet to 6 inches above the work, intensities of from 50 to 500 foot-candles can be made available.

To the right is shown a case where the lighting is satisfactory, but the worker does not see the work clearly. In this case, it is not the lighting that is at fault, but his vision, and he needs the proper kind of glasses. No amount of light can correct defective eyes, any more than glasses can assure accurate vision when the lighting conditions are poor.

* * *

I am not troubled about the future of the railroad business as a whole. If we disregard the water-borne business moving through the Great Lakes and the Panama Canal, the railroads move in excess of 80 per cent of the commercial freight traffic as measured by the ton mileage. They furnish the best and cheapest land transportation service available and, with the elimination of unprofitable mileage, stations, and other facilities which are no longer productive, they will in time, if left alone, work out their problems and fully recover.—*L. F. Loree, President, Delaware & Hudson Railroad Co.*

Unsatisfactory Lighting, Using a Bare Lamp. The Direct Glare Tires the Worker's Eyes

Bowl Type Reflector Aids in Giving the Best Kind of Local Lighting for Shop Operations

Poor Eyesight will Make Work Appear Dim. The Remedy is Glasses, not More Light

New Helical Lead Checking Machine

IT is a generally known fact that helical gears produce less noise than spur gears. This reduction in noise is almost entirely due to the pitch helix. A spur gear transmits motion uniformly from one shaft to the other by means of its tooth curve, while a helical gear transmits the motion principally through its pitch helix; hence, in spur gears, uniformity of motion depends on the accuracy of the tooth curve, while in helical gears, it is the accuracy of the pitch helix that is of prime importance. However, the tooth curve in helical gears obviously must be accurate enough to avoid interference.

The general assumption is that it is much easier to produce a helix accurately in present machining practice than it is to produce an accurate involute curve. Experience has shown, however, that this assumption is not always correct, and that even when production machinery is set up theoretically correctly, the helices of gears are often imperfect. It is evident that differences in the helices of mating gears on parallel shafts must be avoided if full efficiency and quiet operation of the gearing are to be obtained.

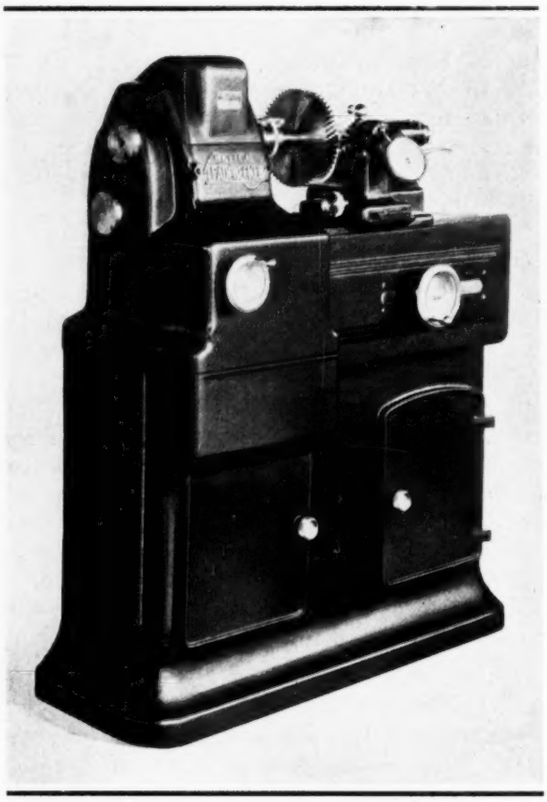


Fig. 1. Illinois Tool Works Helical Lead Checking Machine

The Illinois Tool Works, Chicago, Ill., has just placed on the market a machine for the purpose of determining the accuracy of helices. This machine has a capacity for gears up to 12 inches in diameter and will take work up to 15 inches between centers. It will check helix angles from 0 to 90 degrees. All gears are held between centers; and when thin gears, such as master gears or burnishing gears, are to be checked, they should be held on shoulder arbors to avoid side wabble.

The new testing machine has one horizontal and one vertical slide. These slides are connected by means of a sine bar *A*, Fig. 2, which may be set to any desired angle. A movement of one slide immediately transmits motion to the other slide. Both the horizontal and vertical slides run on V-grooved ball tracks, and these are adjusted tight enough to prevent any backlash, yet permitting a floating movement of the slides. The sine bar is rectangular in shape, and its large cross-section and wide contact surfaces prevent distortion and wear.

The pivot carriage, which rolls on the sine bar, has four rollers, two on each side of the sine bar. The two rollers on one side are mounted on eccentric shafts which are marked for identification. These rollers are adjusted so tight against the sine bar that no backlash can occur, and yet they permit a floating movement of the carriage on the sine bar. A worm and wheel adjustment is provided for the sine bar so that it can readily be set for either right- or left-hand helices.

The vertical slide is connected with steel tapes *B* to a drum on an auxiliary spindle. The principal purpose of the steel tapes is to transform the linear motion into rotary motion without loss or slippage. The steel tapes in themselves have no influence on the accuracy of the rotary motion, since they only serve to transmit the motion. They are drawn very tight by adjustable clamps, so that the motion of the vertical slide and the rotary drums is integral.

The rotary motion is imparted to the main spindle by another set of steel tapes running from drum *C* on the auxiliary spindle to drum *D* on the main spindle. These steel tapes are also drawn very tight by adjustable clamps; their function, as in the previous case, is simply to transmit motion. Both the auxiliary spindle and the main spindle are mounted in preloaded ball bearings, so that the tightness of the steel tapes has no effect on the floating movement of the spindles.

The transmission of motion from the vertical slide to the main spindle is directly through the steel tapes, permitting the main spindle to rotate through an arc of 150 degrees, which is more than ample for all helical gears within the capacity of the machine.

When short leads are to be checked, requiring more than one revolution of the main spindle, the motion is transmitted from the vertical slide through the steel tapes to the drum of the auxiliary spindle and then through a pair of gears to the main spindle. This step-up arrangement is used only for checking worms and similar short-lead work. The change from the direct drive to the step-up drive is accomplished by moving a locking plug *E* within the head from one drive to the other.

The machine is also arranged so that either the horizontal or the vertical slide can be used as the prime mover by merely shifting the position of the operating handwheel at the front of the machine. When the sine bar is nearer the perpendicular position than the horizontal, the vertical slide is used as the prime mover; when the sine bar is nearer the horizontal position than the vertical, the horizontal slide is used as the prime mover.

Fig. 3 shows a test bar for calibrating the helical lead checking machine. Should there be any reason to question the accuracy of the machine, this test bar can be put between centers and the machine set up for even inch leads. The buttons are spaced exactly 1 inch apart, and two separate buttons are spaced exactly 90 degrees from the full row of buttons. The accuracy of the spacing of the buttons can be checked by ordinary methods of measuring. The accuracy of the 90-degree position of the buttons can be checked by means of the square plate that is seen on the left-hand end of the test bar.

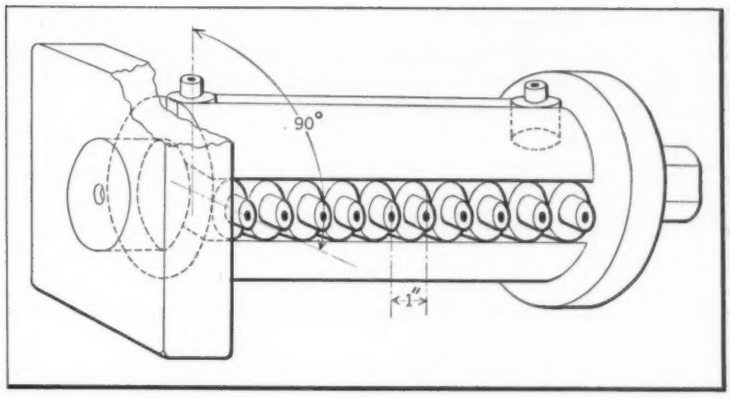


Fig. 3. Test Bar Used for Calibrating the Helical Lead Checking Machine

If the indicator finger is set in contact with one of the two separate buttons and then after one-fourth of a revolution of the test bar, the indicator finger comes in contact with the first button in the full row, then the indicator finger has moved exactly 1 inch in one-fourth of a revolution, which is equal to a 4-inch lead.

If the indicator finger moves from the first separate starting button to the second button in the full row, it has moved 2 inches in one-fourth of a revolution, which is equal to an 8-inch lead. This test may be continued for all the rest of the buttons in the full row, and in this manner the correct setting of the sine bar and the general functioning of the machine can be calibrated. Either right- or left-hand set-ups can be calibrated by starting from either of the separate buttons at the right- or left-hand end of the test bar.

The machine is built in self-contained units to simplify any adjustment that may become necessary from age or from successive changes of temperature. As the spindles are placed in preloaded ball bearings and the slides are run in ball tracks, there is no need of special attention being given to these parts, except to see that they are kept free from dust.

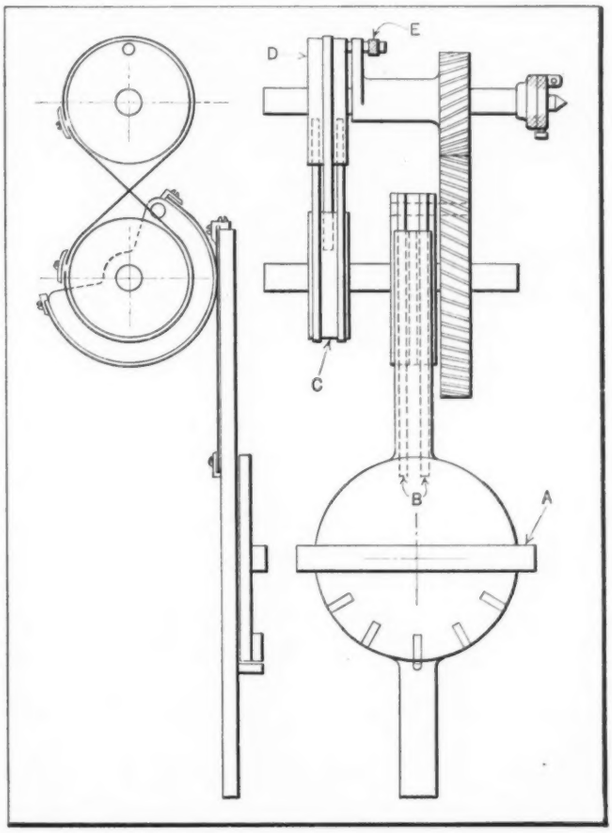


Fig. 2. Diagrammatical View, Showing the General Arrangement of the Important Parts of the Lead Checking Machine

* * *

Annual Meeting of Packaging Machinery Manufacturers

The annual meeting of the Packaging Machinery Manufacturers' Institute (H. L. Stratton, secretary, 342 Madison Ave., New York City) was held at the Edgewater Beach Hotel, Chicago, Ill., October 12. At this meeting, the code and problems of the packaging machinery industry were discussed.

Engineering News Flashes

The World Over

World's Deepest Mine Air-Conditioned

News comes from South Africa of the installation of an air-conditioning plant in the Robinson Deep Mine near Johannesburg. The initial cost of this air-cooling system will be approximately $500,000, and the cost of operation will be about $7500 a month. This mine is the deepest in the world, reaching down 8500 feet into the ground, which, in this case, means 2800 feet below sea level. It is believed that the increased efficiency in operating the mine at a level of 7500 feet below the surface, where the most active workings are located, will more than balance the cost of installation and operation of the air-conditioning equipment. It is also believed that the installation of air-cooling plants will make possible mining at even greater depths than those hitherto attempted.

Heavy-Oil Engine for Airplanes

An airplane using heavy oil for its motive power recently made a successful flight at Villacoublay, France, according to a statement by the French Ministry of Air. The plane was a Potez 25 with a new type of 14-cylinder engine. It carried a load of over 4000 pounds.

French Lathe 70 Feet Long

A huge lathe, nearly 70 feet long, with a swing of 6 1/2 feet, has recently been constructed in France by the firm of H. Ernault, of Paris. The machine is capable of accommodating work 5 feet in diameter over the carriages and 69 feet long, weighing up to 80 tons. The weight of the headstock is 40 tons, and the weight of the complete machine, including the electric drive, is 212 tons.

The main drive motor is of 100 horsepower, and drives the headstock directly through a flexible coupling. Six speeds are obtainable through the gear-box and motor, varying from 0.6 to 40 revolutions per minute.

There are five carriages, three in front, which may be used for thread cutting, and two at the rear. The carriages are absolutely independent in all their movements. The machine is electrically controlled, each carriage being provided with seven buttons, giving the operator complete control of the machine from any position.

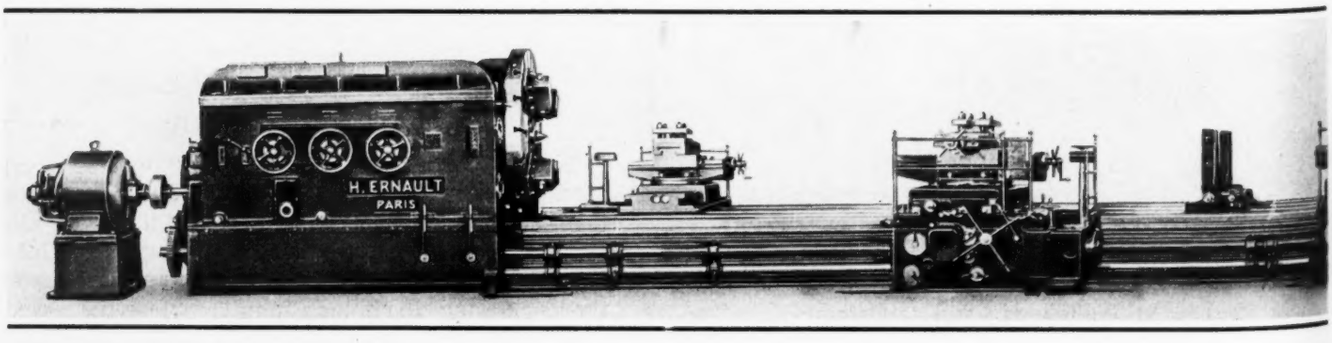
British Locomotive with Six "Engines"

A new type of locomotive has been designed for branch line service on the London and North Eastern Railway. This locomotive is provided with two six-wheel trucks and is equipped with a three-drum water-tube boiler from which steam is supplied to six separate compound two-cylinder engines, one engine being direct-connected to each of the six axles. Economy in steam consumption, and consequently in fuel consumption, is claimed for the new engine.

Small Strain Gage Measures Large Stresses

A fly-weight recording strain gage, known as the de Forest scratch recording strain gage, has recently been developed by the Baldwin-Southwark Corporation, Philadelphia, Pa. This instrument is

Huge French Lathe of 6 1/2-foot Swing, Weighing 212 Tons, Equipped



actually no larger than a latch key and weighs but a fraction of an ounce; yet it makes an autographic and permanent record of the strain measured. Because of its small size, it can be mounted in positions and places where other types of strain measuring devices cannot be used. For example, records have been secured with this gage of the strain variation in an airplane propeller blade while in flight. The record is scratched by an abrasive and must be evaluated under a microscope. A measurement, together with a knowledge of the material under strain, gives, by a simple calculation, the stress in the fiber under investigation.

Pitch of Airplane Propellers Adjusted in Flight

The installation of controllable-pitch propellers on planes of the United Air Lines is claimed to have increased their cruising speed considerably and shortened the time of take-off from nineteen to fifteen seconds. The blades of these new propellers can be changed to different angles during flight. In taking off, the propellers are placed in "low gear"—that is, with the blades at a relatively slight angle to enable the plane to climb more quickly. When the proper flying elevation is reached, the propellers are shifted into "high gear"—increasing the pitch of the blades and adding to the cruising speed of the plane.

Russian Industries Branch Out

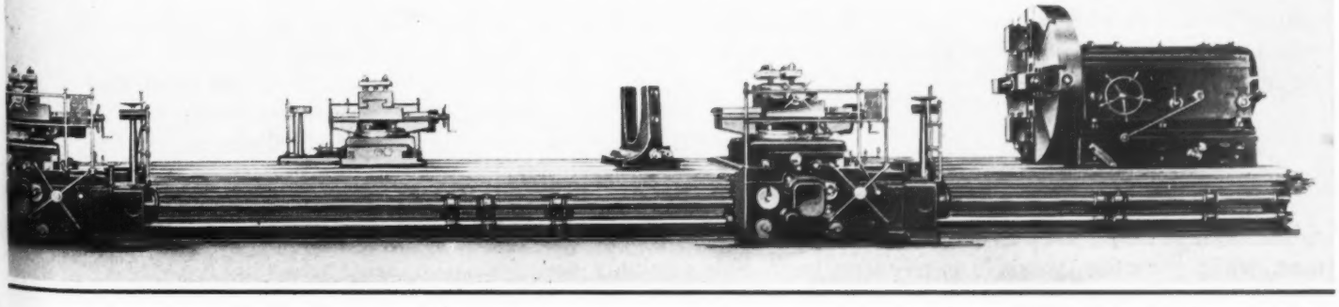
Everything that is manufactured in Soviet Russia is not for utilitarian purposes. In 1933, for example, musical instruments to a value of $200,000,000 were manufactured, including some 3400 grand and upright pianos and 5000 high-grade violins. Two new factories are under construction, one for stringed instruments and another for wind instruments. Last year, 70,000 phonographs were made at a Leningrad plant. Another plant is being built and the present plant is being expanded so that a total capacity of 500,000 phonographs a year will be reached. A phonograph-record plant near Moscow has produced 6,000,000 records up to the present time. It is reported that a new plant is under construction at Noginsk that will have an ultimate annual capacity of 40,000,000 records.

World's Largest Circuit-Breakers

The 287,500-volt transmission lines from Boulder Dam to Los Angeles, Calif., will be protected by eight General Electric impulse oil circuit-breakers. These circuit-breakers are unusual in several respects. They will be used at a higher voltage than any previous circuit-breakers; they are rated to interrupt the circuit in slightly more than one-third the time of the fastest circuit-breakers heretofore available for high voltages; the complete units will weigh less than the oil alone now required for circuit-breakers of the conventional design; and they will require less than 5 per cent as much oil as the usual circuit-breakers for such voltage. They have an interrupted rating of 2,500,000 K.V.A., and have a rated opening time of three cycles, or 0.05 second. The fastest time for high voltages in the past has been eight cycles.

German High-Speed Unit Train Proves Successful

The service recently inaugurated between Berlin and Hamburg, a distance of 178 miles, by the use of high-speed, light-weight unit trains, has proved so successful that arrangements are now in preparation for inaugurating similar services between Berlin and Leipzig, and Berlin and Dresden. It is planned, within the next few years, to introduce similar fast light-weight train services on nineteen additional lines, including such long-distance services as Berlin to Munich, Cologne, and Königsberg. The total length of lines covered by these proposed services is 5800 miles. The present average running time of the express trains between the cities mentioned is 43 miles an hour, which will be increased to an average speed of 64 miles an hour by the high-speed train units, each of which will accommodate 180 passengers.



with Five Carriages, Each of which has Independent Electric Control

EDITORIAL COMMENT

Do Present Government Policies Help or Hamper Recovery?

The effect of the NRA policies on machinery purchases was the subject of one of the papers read at the recent fall meeting of the Production Division of the Society of Automotive Engineers. The author of the paper—a man with thorough managerial and production experience—pointed out that until industry is given an opportunity to manage such of its affairs, itself, as can be efficiently handled only by men of industrial experience, no expansion program and only limited replacement programs can be expected. Obviously, no one is encouraged to spend money on equipment for a plant, the policies of which he feels that he is not free to determine without interference. Hence, re-employment in the equipment industries is retarded rather than helped by present governmental policies.

The fallacy of the doctrine that cost-reducing machinery and efficient operation are detrimental to industrial recovery was emphasized. Many prominent engineers present at the meeting agreed that the NRA administration must definitely change its attitude toward industry if it wishes to accelerate industrial recovery. The hope was expressed that the Government would recognize this and make a decided change in its policies concerning industry. When those at the helm of our national affairs recognize that recovery from the depression is impossible unless there is industrial recovery, and that industrial recovery is possible only with an industry that is not shackled by innumerable regulations and governmental interference, then—and only then—will there be real recovery.

All industrial executives were urged to unite in an effort to secure such a change in the attitude of the Government as would accelerate the recovery of industry and the re-employment of workers. If the Government will develop a constructive policy looking toward recovery, industry may be depended upon to do all in its power to cooperate with the Government.

There is a Place for Machine Equipment in the Office Too

In many plants, the latest types of production machinery are being used in manufacturing operations, while the office work is carried on in much the same way as it has been for many years. Full advantage is not taken of the time-saving possibilities of the so-called "business machines" that are now available. Much accounting work can be easily and cheaply done by the use of suitable accounting machines, and many records necessary in manufacturing establishments can be conveniently kept with the aid of business machines; but the mechanization of the office too frequently lags far behind that of the shop.

As an actual example of the savings possible in a large organization by the use of business machines may be mentioned the experience of a British automobile manufacturer who equipped his plant with computing and other types of business machines to a total value of $250,000. He states that this large sum has been recovered in a year through savings due to the use of this equipment.

Obviously, it will pay manufacturing organizations to look into this matter and find out whether they are making full use of the business machines available.

The Inventor's Key to Success is to Think of it First

The recognition of a need that prompts the inventor to seek a new device or method is often of even greater importance than the development of the mechanism that makes the invention workable. The way to supply a need may be very simple when the need is once recognized. For example, when the idea is conceived that a certain shop operation can be performed in a new manner, the mechanical means for performing it may be easily devised.

In some cases, a need is so thoroughly recognized that we find dozens—sometimes hundreds—of inventions all intended to accomplish the same purpose. In that case, most of the inventors will not reap any financial benefit from their inventions; more likely, their efforts will prove to be a source of loss. It is not enough to recognize a need; the important point is to recognize the need before anybody else does.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Cam and Roller Mechanism for Obtaining Instantaneous Movement

By A. R. KLIGMAN

One of the best known means of imparting a very quick movement in one direction to a reciprocating part of an automatic machine is by a cam and spring mechanism, such as shown in Fig. 1. The member to be actuated (not shown) is attached to the upper end of link *A*. The other end of this link is connected to the rocker lever *B*, pivoted on stud *C*. Lever *B* acts in conjunction with cam *J* through roller *E* and spring *F*.

Fig. 1 shows the mechanism just at the end of a dwell period of the lever *B*. Further rotation of the cam in the direction indicated by the arrow will result in roller *E* dropping into the recess of the cam and thus producing a quick downward movement of lever *B* and link *A*. It is clear that no matter how heavily spring *F* is loaded, there is only a slow accelerating movement of lever *B* while point *G* of the cam moves from the position shown to point *K* on roller *E*, describing the arc *GK*. Only when the cam has made an angular movement equivalent to angle *GDH* does lever *B* completely lose the restraint imposed upon it by the cam and roller and allow spring *F* to pull lever *B* downward

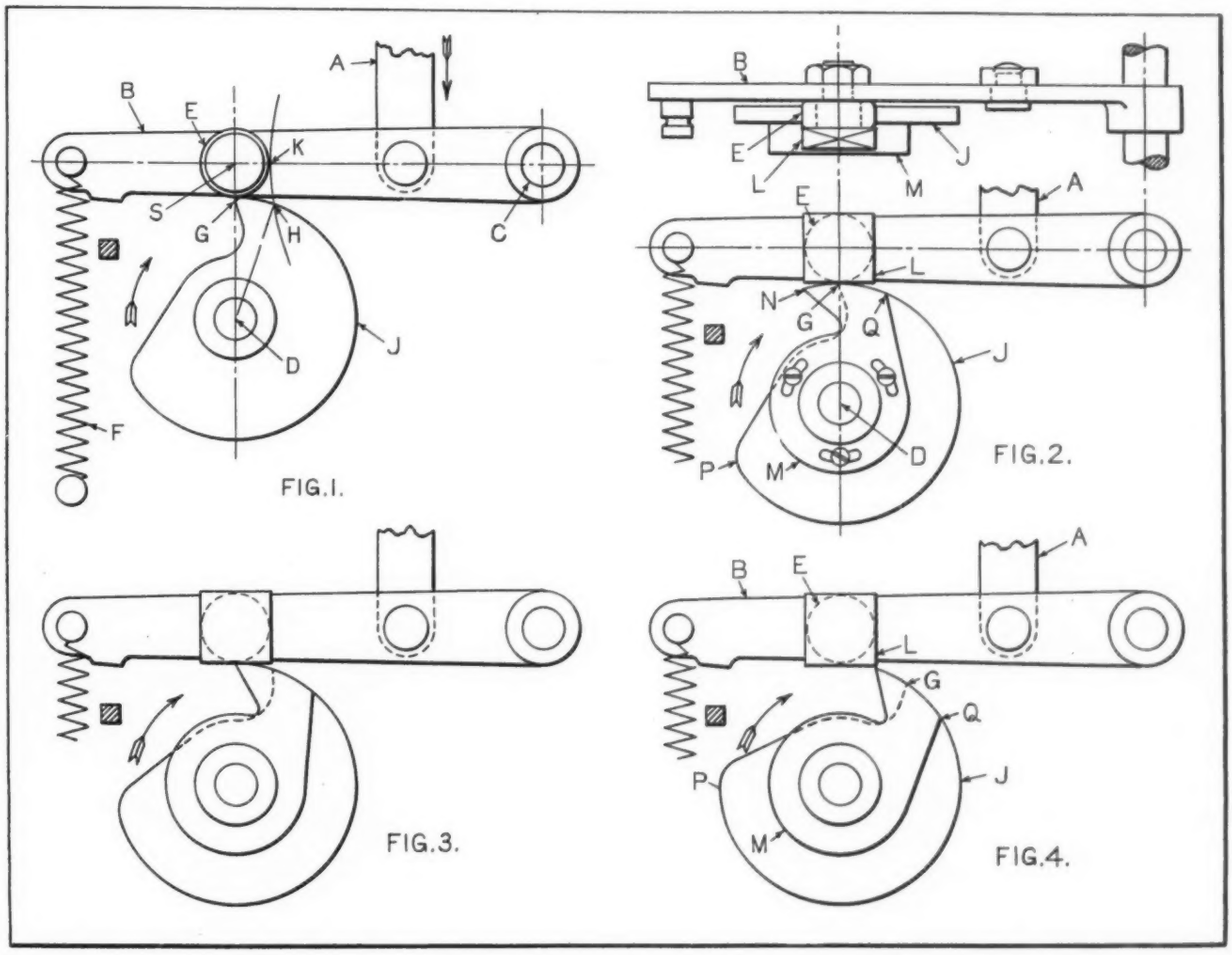


Fig. 1. Cam and Spring Mechanism for Obtaining Quick Downward Movement of Link A and Slow Return. Fig. 2. Design Shown in Fig. 1 with the Addition of Block L and Cam Shoe M. Figs. 3 and 4. Diagrams Indicating Action of Mechanism Shown in Fig. 2

with a quick motion. The point H is found at the intersection of the cam outline with an arc KH swung about stud C as a center and tangent to roller E.

The angle GDH, through which the cam rotates during the delayed action, depends primarily on the length of the radius of the roller E and to a much smaller extent upon the lengths CK and GD. This angle represents, in terms of angular velocity of the cam, the delay in the time of the snappy spring action, the delay being greater the larger the roller size, the shorter the roller arm CS, and the slower the rotation of the cam.

In most cases, this delay is not objectionable. It may even be welcome in some cases, as it results in much less shock to the mechanism. However, there are occasions when this delay must be eliminated, as for instance, when a hot fluid which sets very quickly must be pumped into a mold. Under such conditions, a very sudden action on the fluid-forcing pistons is desired. Fig. 2 shows how this action can be effected by the addition of a few parts.

At the side of cam J is mounted an auxiliary shoe M, which is rotated about shaft D. This shoe acts with the square block L, which is held rigidly to the lever B. Lobe NQ of the shoe M remains in contact with block L for some time after cam J has lost contact with the roller E. During the time cam J and shoe M are rotating from the position shown in Fig. 2 to that shown in Fig. 4, lever B remains nearly stationary, as the lobe NQ of shoe M slides underneath the flat face of block L. Further movement of the cam and shoe in the same direction results in an instantaneous drop of lever B. Fig. 3 shows the positions of the various members of the mechanism when the cam has rotated to a position midway between the positions shown by Figs. 2 and 4.

Following the sudden drop of lever B, shoe M and block L are inoperative. After the desired dwell, the system is restored to its initial position by the lobe P of the cam, which acts upon the roller E alone. Just before the end of the cycle of shaft D, both the roller and the block engage the cam and the shoe simultaneously. A little care in the design of the details insures smooth operation.

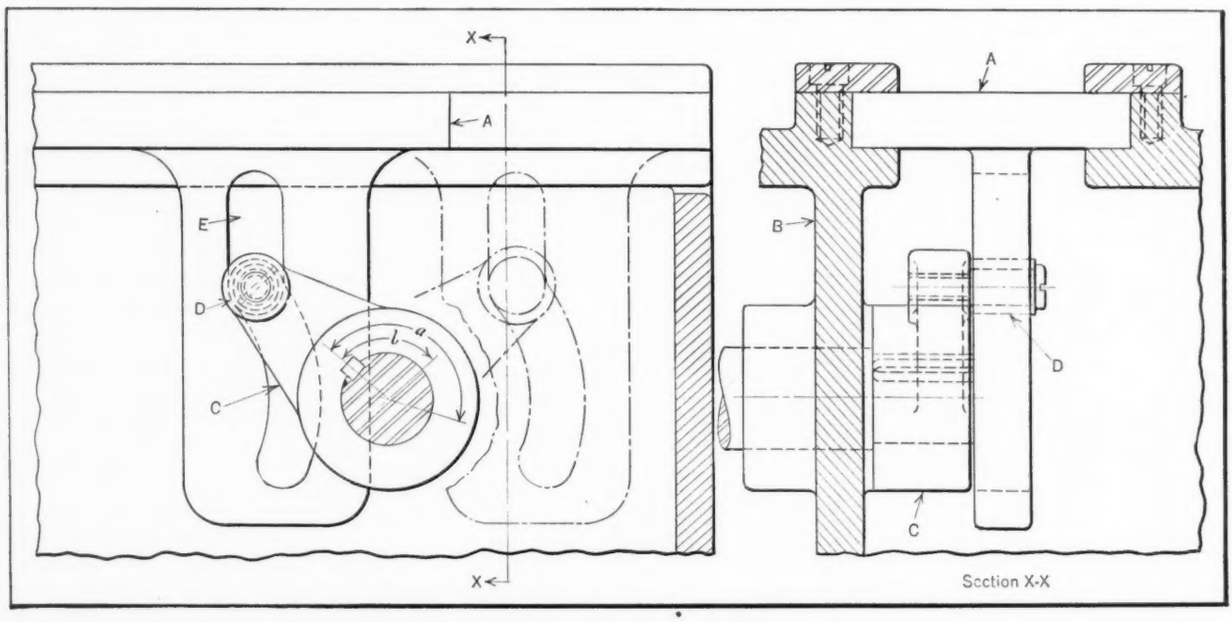
It is clear from Fig. 2 that the angular margin between points N and G can be materially reduced without danger of the roller interfering with the cam during the sudden drop. If desired, this angular margin can be increased, provided lobe NQ of the shoe is made of sufficient size. This is a very desirable feature, as the exact moment of the drop can be adjusted within fairly wide limits, independent of the exact moment of the withdrawal movement.

If it is decided to completely eliminate all but the sudden movement of lever B or if it is necessary to minimize the load on the sliding surface of the shoe and block or to accomplish both these objects, the under side of the shoe can be made concave to conform in curvature with the lobe on the shoe.

Mechanism for Obtaining Intermittent Slide Movement from Oscillating Lever

By J. E. FENNO

The screw shells on the plugs attached to electric extension cords are spun in place on the plugs in an automatic machine. The assembled shell and plug is delivered to the machine from the magazine by means of a feed-slide having an intermittent



Mechanism for Obtaining Positive Intermittent Movement of Slide from Oscillating Lever

movement—that is, a dwell is provided at one point of reversal of the slide. However, the slide is designed to have a positive action. The dwell occurs when the slide has carried the plug to its spinning position and continues until the shell has been spun and the finished plug ejected from the machine.

Referring to the illustration, the feed-slide *A* is mounted in guides on the machine frame *B*. The actuating lever *C* is equipped with a roll *D* which engages a cam slot *E* in a projection on the slide. The illustration shows the empty slide in the position it occupies after being carried back toward the left to the magazine (not shown). As the lever reverses its motion, the slide is returned with a plug to the position indicated by the dot-and-dash outline, the lever rotating through angle *b*. This is the position of the slide while the plug is being spun. The dwell of the slide that permits this operation is obtained as the lever continues its movement along the curved portion of the cam slot, the latter being concentric with the lever shaft at this time.

The dwell continues until the lever has moved through the angle $a - b$ and back to the position shown by the dot-and-dash outline. At this point the completed plug is ejected from the slide by a device not shown. The continued movement of the lever returns the slide to the magazine ready to pick up another plug.

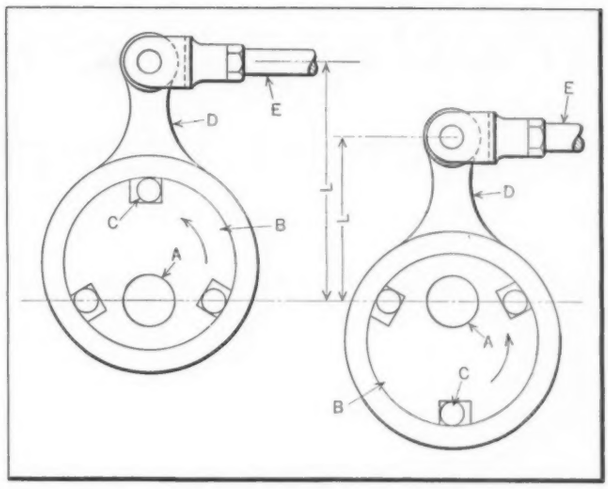
Variable-Stroke Ratchet Movement

By L. KASPER, Philadelphia, Pa.

On a special polishing machine, the work is passed under a set of oscillating brushes charged with abrasive. In the original design, the work-table was fed at a uniform rate by means of a toothed ratchet, which transmitted its movement through a shaft to the work-table. However, under certain lighting conditions, the surface of the polished work showed a series of marks corresponding to the movement of the work-table. Though it was considered impossible to eliminate the marks entirely, it was thought advisable to break up their symmetry, so as to render them less noticeable. This was accomplished by the use of a variable ratchet movement, the design of which is shown in the accompanying illustration.

The shaft *A* which operates the work-table carries the eccentric *B*, which is keyed to it. The eccentric *B* is encircled by the strap *D*, which is given an oscillating motion by the rod *E*. Eccentric *B* is grooved to receive the rollers *C*, forming a conventional type of roller clutch which operates through the wedging action of the rollers *C* between the eccentric *B* and the strap *D*.

As the eccentric *B* revolves with shaft *A*, the effective length *L* of the lever arm changes constantly, the range of variation being controlled by the throw of the eccentric *B*. The view to the left shows the mechanism with *L* at its maximum, while the view to the right shows *L* at its minimum. As the reciprocating movement of rod *E* is constant, the degree of movement imparted to shaft *A* is controlled by the length *L* of the lever arm. One cycle of variations is produced at each rotation of shaft *A*.



Mechanism in which Eccentric Mounting of Ratchet Member B Varies Effective Length L of Ratchet Arm from Maximum to Minimum Once in Each Revolution of the Driven Shaft A

* * *

New Publication of Motor and Generator Standards

Superseding and greatly amplifying the 1930 edition, a new book entitled "NEMA Motor and Generator Standards" has been published by the National Electrical Manufacturers Association. The 1934 edition brings together much information not previously published and constitutes a reference work of practical information concerning the manufacture, testing, and performance of motors and generators. The material presented is arranged in readily usable form.

The section of definitions, in which over one hundred and fifty terms used in dealing with motors and generators are defined, has been considerably amplified. Standardized mounting dimensions for motors are included in the new publication. Many motor manufacturers have been supplying motors in accordance with these standard mounting dimensions for some time, but this is the first time that this information has appeared in print. The new book should prove useful to the consulting engineer, the machine designer, and the purchaser, since it sets forth in convenient form that which is adopted as standard by the motor and generator industry. The book may be obtained for $2 per copy from the National Electrical Manufacturers Association, 155 E. 44th St., New York City.

Applying Finish to Chevrolet Bumpers

Automatic Conveyors and Special Work-Handling Fixtures Take the Fabricated Bumpers through the Pickling, Cleaning, Polishing, Plating, and Buffing Operations at the Rate of 440 an Hour

By J. M. BONBRIGHT
The Chevrolet Motor Co.

SPRING steel bumpers are now being made, from the raw material to the plated and packaged sets, at the rate of 440 an hour at the Chevrolet Motor Co.'s spring plant in Detroit, Mich., which supplies bumpers for all nine of the Chevrolet car assembly plants in the United States. To maintain production at this high rate, Chevrolet has developed methods of material-handling that keep up a constant flow of bumpers through the plating and polishing departments, which have been laid out for the effective use of special machinery and the exact application of abrasives to insure uniform results.

An important factor contributing to the efficient and economical operation of the department is an air-conditioned and temperature-controlled shop in which the polishing wheels are built or rebuilt and then stored for forty-eight hours' conditioning before use. Both the nickel- and the chromium-plating of bumpers are done in departments that handle these parts exclusively. The plant, therefore, is able to use methods of plating and polishing that are particularly suited to the material and to the heavy-duty finish required for bumpers, which are the most vulnerable units of a car.

Pickling and Cleaning Fabricated Bumpers

Bumper bars flow in a constant stream on overhead conveyors from the buildings in which they are fabricated to the adjoining finishing plant. Here the first step is the pickling process. Two workers pick the bumpers off the incoming conveyor and suspend them, by slipping the eyes over hooks, on automatic carriers holding eight bumpers apiece, which pass them successively through five different tanks. The speed of the conveyor and the lengths of the tanks regulate the time for each of the five treatments, thirty minutes being required for the whole series.

In the first tank, the bumper bars are cleaned in a sulphuric acid pickling solution. After passing through a high-pressure water spray in the second tank, they are given a short dip in the third tank, which contains a solution of caustic soda and potash to remove any soot that may be left after pickling. In the fourth and fifth tanks, they are washed in jets of water and dipped into hot water. At the discharge end of the conveyor, the bumpers are removed by hand and transferred to hooks on a chain conveyor that transfers them to the rough-polishing section.

Rough-polishing is performed on four lines of automatic machines, each having fourteen wheels. Two operators, one to load and one to unload, serve each line. A belt conveyor, equipped with lugs to keep the work from slipping, carries the bumpers at the rate of eight a minute under the wheels, which are spaced slightly more than a bumper length apart. Each wheel, with its drive and its mounting, forms a separate unit.

Because of the bowed shape of the bumper and the difference in the shapes of the front and rear bumpers, the wheels are free to move vertically, being mounted on the end of a pivoted frame which supports the motor on its other end. The drive is by multiple V-belts and pulleys. Normally, the wheels are barely separated from the surface of the conveyor belt.

As a bumper passes under the wheel, close contact is maintained by the weight of the wheel and its frame, and in some cases by added weights. As the height of the bumper increases toward the middle, the wheel is positively limited from rising farther and the bumper is actually flattened out as it passes under the wheel. Firm contact is thus attained, either by gravity or by compression of the bumper, over the whole length of the piece.

Kinds of Polishing Wheels Employed

Sixteen-inch wheels, running at 1750 revolutions per minute, are used. The rotation of the wheels is in the opposite direction to that in which the bumpers are traveling on the conveyor. Both full and half wheels are used in each line. Full wheels, 4 1/2 inches wide, bear directly on the center line of the bumper bars, which are 3 1/2 inches wide. Because the face of the bar is convex from edge to edge, half wheels, 3 1/2 inches wide, are used to bear on the surfaces at each side of the center line to polish the outer margins and the edges. Both classes of wheels have their faces shaped to conform, when under load, to the convex face of the bumpers.

Both full and half wheels make up the total of fifty-seven wheels in the four lines, but are used in varying ratios in each line. The wheels in the four lines and the grades of abrasive used are as follows:

Line 1: 6 full, 8 half wheels; grades 60 and 70
Line 2: 10 half, 4 full wheels; grades 70 and 100
Line 3: 10 full, 4 half wheels; grades 120 and 140
Line 4: 8 full, 4 half, 3 full wheels; grades 120, 140, 160, and 180

The last four wheels in the third line and all fifteen wheels in the fourth line are compressed grease wheels. These wheels give the final high polish with the finer grades of abrasives.

As the bumpers come off the third line they pass before an inspector, and any pieces not perfectly finished are diverted to a stand of two wheels, where the defects are corrected by two operators. These wheels are provided with a specially designed work support, mounted on the floor directly beneath the wheels, to facilitate handling the work. By placing the bumper eye in a socket and then rocking the bar forward and back on the pivoted spring support, the operator can bring any part of the surface in contact with the wheel.

Fig. 1. Operator Transferring Bumper from Unloading End of Conveyor of First Automatic Polishing Machine to Conveyor Leading to Next Machine

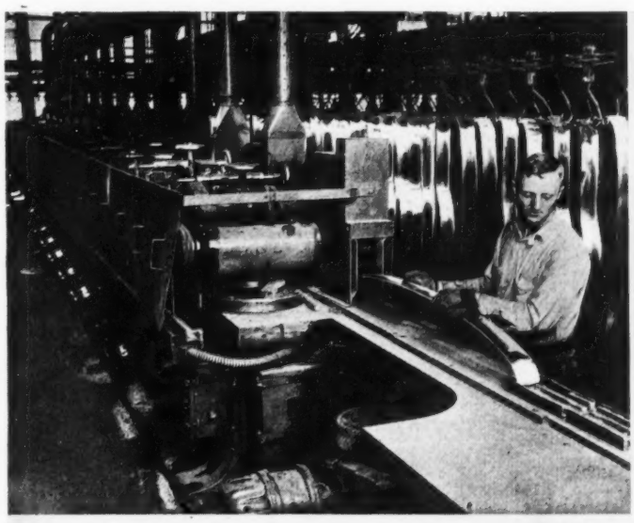
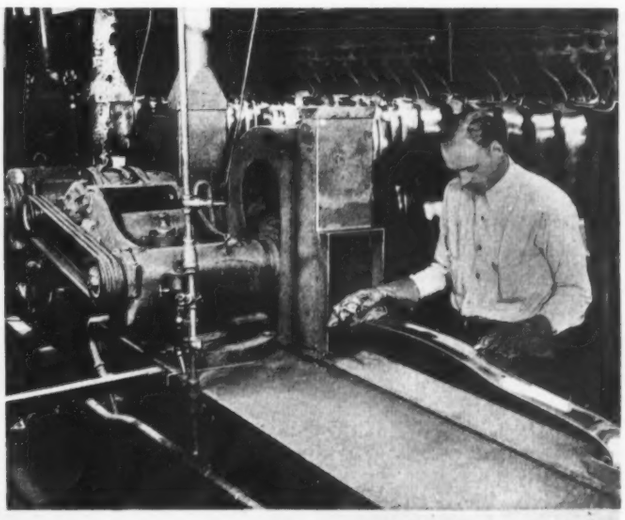


Fig. 2. Inspector at End of Third Automatic Polishing Machine Ready to Approve the Bumper Bar or to Mark it for Routing to "Touch-up" Machines



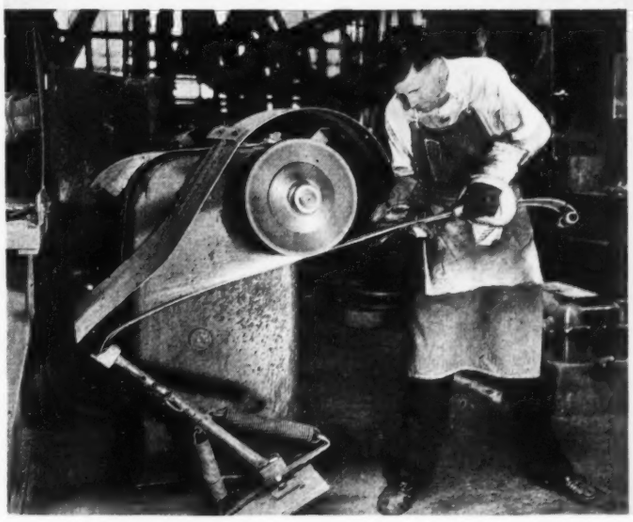


Fig. 3. "Touching-up" a Bumper not Approved by Inspector. The Curved End of the Bar is Held in a Socket of the Floor Fixture which Enables Any Part of the Bumper to be Refinished

Fig. 4. Polishing the End of a Bumper, the Eye of which is Slipped over a Pin Mounted on a Lever. By a Foot-pedal, the Operator Controls the Pressure Exerted on the Wheel by the Work

Bumpers passed by the inspector travel on a conveyor from the final line of automatic polishing machines to hand polishers, which finish the ends and touch up the concave curves that escape the full action of the automatic wheels. This work is performed on fourteen upright machines, each having two 5 1/2- by 16-inch wheels—a rough-polishing wheel using a 70-grade abrasive and a finishing wheel using an abrasive of 140 to 180 grade. These wheels run at 2200 revolutions per minute. There is an operator for each wheel.

These machines also are provided with special work-handling fixtures. For polishing the end of the bumper where the bar is curled back to form the bolt-eye, a floor fixture is arranged with a pedal by means of which the bumper end, slipped over a horizontal pin, may be pressed firmly against the wheel while the operator swings the bar vertically around the pin.

Nickel-Plating Polished Bumpers

One hour and a half after a bumper reaches the polishing machines, it is ready for the nickel-plating, which requires about sixty minutes. The process consists of thirteen cleaning and plating operations, as follows:

1. Wash in muriatic acid
2. Spray with hot water
3. Wash in caustic soda
4. Spray with water
5. Wash in muriatic acid
6. Spray with hot water
7. Nickel-plate
8. Spray with water
9. Copper-plate
10. Spray with water
11. Nickel-plate
12. Spray with water
13. Dip in hot water tank

The bumpers are carried through the various tanks on automatic carriers that are accurately timed. From the nickel-plating department, the bumpers travel on conveyors to the automatic buffers. Here the wheels revolve in the same direction as the work moves.

Using Automatic Buffing Machines on Plated Work

There are three lines of automatic buffing machines, each with four wheels 18 inches in diameter and 2 1/2 inches wide, running at 1750 revolutions per minute. These machines are fed by means of flat belt conveyors similar to those used in the automatic polishing machines. From the automatic buffers, the bumpers go to hand buffing machines, where the ends are buffed. They are then turned over to two touch-up men, who make them ready for the chrome-plating.

Chrome-Plating over Polished Nickel

The chrome-plating process takes twenty minutes. The various steps in the operation are as follows:

1. Immersion in caustic cleaning tank
2. Water spray
3. Immersion in muriatic acid tank
4. Water spray
5. Immersion in chromic acid tank
6. Water spray
7. Hot water dip

The final step before the bars go to the assembly plant consists of spraying the back surfaces with aluminum paint as they travel on a conveyor to the assembly line.

Equipment and Methods Used in Conditioning Polishing Wheels

Chevrolet has equipped its wheel room, where the abrasive wheels are built and rebuilt and stored, with an efficient system of air conditioning and temperature control. Increased efficiency and added life are given the wheels by careful regulation of temperature and humidity.

When the abrasive surface is worn down, the wheels are removed from the machine and taken to the repair room for cleaning and recoating. The faces of the wheels are first formed to fit the face of the bumper bars. Either cement or glue, depending upon the grade of abrasive, is then applied. (Nos. 60 and 70 grades are cemented; the finer grades are glued.) The full series of abrasives used includes grades 60, 70, 100, 120, 140, 160, 180, and 200. The abrasive is applied to the glue or cement by machines that rotate and pound the wheel in a box of abrasive. Several layers are applied to build a wheel up to suit requirements.

Newly coated wheels are stored for forty-eight hours in the drying room, which is kept at a temperature of 72 degrees and a humidity of 40 to 50 per cent. This conditioning process hardens the abrasives and prevents their cracking when placed in operation.

* * *

New Plants in Soviet Russia

New manufacturing plants are constantly being completed in Soviet Russia. The first section of a locomotive works in North Caucasus will begin operation toward the end of this year. The capacity of this plant will be 400 locomotives a year. The Kashira plant for the building of electric locomotives will have a capacity of 600 a year. A site for a new automobile plant near Samara has been selected. This plant will have a capacity of 40,000 trucks annually.

The 75,000th tractor built at the Kharkov tractor plant left the conveyor on August 16. The first synthetic rubber plant in the Soviet Union turned out 2360 tons of rubber during the second year of its operation just ended.

Plants are also being built for the manufacture of goods that are not entirely necessities. Piano factories are under construction at Tiflis and at Leningrad that will have capacity for producing 3000 and 16,000 pianos a year, respectively.

How Government Policies Affect the Machinery Industry

In a paper entitled "Machinery and Equipment Policies in View of the Present Business Situation," read before the Society of Automotive Engineers in Detroit, J. E. Padgett, Assistant General Manager of the Spicer Mfg. Corporation, Toledo, Ohio, strongly emphasized the need for a change in governmental policies in order to assure recovery in the machinery industries. The present article is an abstract of Mr. Padgett's paper.

FOR several years, there has been a decided shrinkage in the working capital of most manufacturing organizations. Industry in general, however, has adjusted itself quite well to the conditions created by the depression and would now be on the road to more normal operation, if it were not for the fact that the acts and policies of the Federal Government have had a tendency to augment the difficulties. The policies of the NRA, especially, tend to increase costs considerably, without affording even a reasonable return on the investment.

The machine tool builders, in an effort to obtain sales for new types of equipment, where it would not be possible to sell mere replacement machines because of the unused equipment available, are very active in developing entirely new machines. Under these conditions, a machine may become obsolete quite rapidly because of radical changes in methods and design. In normal times, these new developments would stimulate sales materially, but the normal course does not work freely because of artificial restrictions. If the restrictions were removed, there would be new activity in industry.

Does the NRA Help or Hinder Business?

The operations of the NRA, the various labor boards, and other Governmental bureaus all tend to increase the hazard as well as the cost of doing business and reduce the returns to the vanishing point or turn them into losses. The NRA has discouraged the use of cost-saving equipment because, in the opinion of Government officials, this makes fewer jobs instead of more. These officials seem to forget that their measures produce high costs, resulting in a shrinkage of purchasing power and thereby causing a loss of jobs. Witness the results in the textile industry which raised wages, increased the material prices, restricted the output per man, and restricted the purchase of better equipment. Unfortunately, the public did not like the increased prices and bought less. Finally, the unions went on strike, because the workers were worse off than before.

The automotive industry has always aimed at increasing consumption through lower prices, and has built a vast structure on that basic principle. Is the Government to change this principle by methods that must fail? If so, there is no incentive for capital to risk more than it now has at stake.

Executives with a Capacity for Clear Economic Thinking are Needed

It is, therefore, of the greatest importance that every executive responsible for the earnings and welfare of thousands of working men should study and recognize the real troubles that a continuation of present Government policies will create. Industrial executives have a grave duty to perform in assuming the leadership of the vast number of men for whom they are responsible. These men want an opportunity to earn as much as possible without Governmental interference.

Industrial executives should think deeply and seriously about the present Government tendencies; should note the real results of the present bureaucratic growth and experimental legislation; and, after recognizing that in its essentials this legislation is destructive of all the principles that have built up our country, should work for a change that will be constructive in the future.

We may have the greatest respect for professors, theorists, and idealistic creative thinkers in their proper place. We owe much of our progress to the paths that they have pointed out in the past; but their place is not in executive positions.

The Pendulum is About Due to Swing Back

The side of the picture that has been brought out is the one that is not so pleasant. There is a better side, the effects of which would be noticeable at once if the free flow of normal forces were allowed to operate. Everything in life works in cycles, and the old expression "It is darkest before dawn" usually holds. This means that the conditions of today will awaken people in general to the destructive forces that are at work, and will cause a reaction that will put us back on a course where there will again be a chance for prosperity for all. Taxpayers in general and business men in particular will soon find what it means to pay for the present tremendous uncontrolled expenditures. The livelihood of the working people depends largely on how soon public reaction gets around to recognizing the need for a change in the present tendencies.

This is the Right Time for Equipment Purchases

Now, referring specifically to the machinery industry, it is fairly certain that, for long-time planning, equipment should be purchased in the most sparing fashion when productive operations are high. But it should be purchased in the greatest amounts after passing the bottom of a depression, because these purchases will permit lower costs and successful manufacture during the expansion period, and make it possible to take advantage of all the developments and inventions that have been made during the depression.

This course would doubtless be taken right now by successful businesses if the normal economic cycle were left to itself. As a result, business would be started on the up grade and employment would become normal. If we can change the Government's attitude, so that it will allow the normal operation of economic law, we will rapidly recover, to the general benefit of everyone; but to swing the Government trend into this course, there must be definite concerted action on the part of everyone who can think clearly.

It is Time to Return to the Old Yankee Virtues

If we want to regain material prosperity, we must restore the old integrity, clear thinking, and hard working of the Yankee, who typifies the progress of this country. This means the restoration of conditions under which the fruits of hard work and clear thinking are worth the effort. Present tactics will so soften the moral fiber of a great many people in this country that some of them will never be able to do a real job again.

Most of the present conditions are not the result of the war, of capitalistic design, or of any of the other causes ordinarily given. Primarily, and at the bottom, they are the result of a soft doctrine that has taught that it is possible to live on a high material plane without the hard work and the sacrifices that pay for it. We have been taught to live off the other fellow, off future income, and now off the Government (which is still the other fellow), all without work. Did the people who suffered, worked, sacrificed, and thought in order to build this country, so that they, themselves, and the country could be prepared to weather a storm—did they do as little as possible? Did they follow the crowd that tries to live off the efforts of others?

Science recognizes that the greatest force in the world is the force of self-preservation, which means individual reward for individual work and sacrifice, and individual responsibility and suffering for failure. Nothing but the natural law of self-preservation will spur most people to work, so that they may get themselves out of this trouble. We have broken down and softened the moral strength of our people, and we must start the long struggle of building it up on a rock foundation again. Man is much like a tree. In the tropics trees grow large and fast and soft, and are subject to quick and easy decay. It takes the struggle and hardships of the northern winter to produce the firm, hard trees that can weather storms for centuries.

* * *

Stud-Removing Kink

By WILLIAM C. BETZ

If a broken stud or screw cannot be removed readily with the aid of an "easy out," it should be loosened by playing an acetylene flame into the "easy out" hole until the screw is red hot. On cooling, the screw can be removed without trouble.

Heating the screw expands the metal surrounding it and as the hot metal cannot expand in any direction other than toward the center of the hole, due to the cold mass surrounding the screw, the latter is reduced in diameter. When the mass cools, the screw shrinks still more and the metal surrounding the screw enlarges to its original diameter, leaving the screw free in the hole, so that it may be removed with the "easy out" or the fingers.

* * *

Timken Awarded First Prize in Advertising Contest

Readers of MACHINERY who have seen the Timken Roller Bearing Co.'s advertisements from month to month will be interested in learning that the Timken company was awarded first place by the judges for the most effectively conceived and executed industrial advertising campaign of the year in the Tool and Equipment Division of the National Industrial Advertisers Association, at the annual convention recently held in Cincinnati.

Improvements in Motor Mounting Methods

Flanged Mountings and Close-Coupled Drives of Standardized Dimensions Facilitate Applications and Insure Permanent Alignment of Motor and Driven Member

By J. V. HUNT, Industrial Department
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

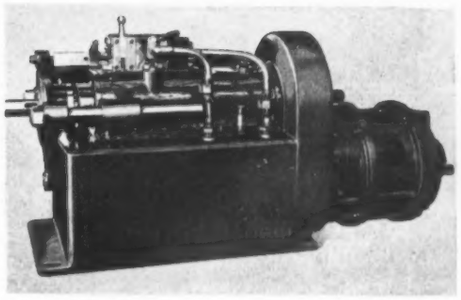


Fig. 1. Hoefer Hydraulic Drilling Unit with Self-contained Motor

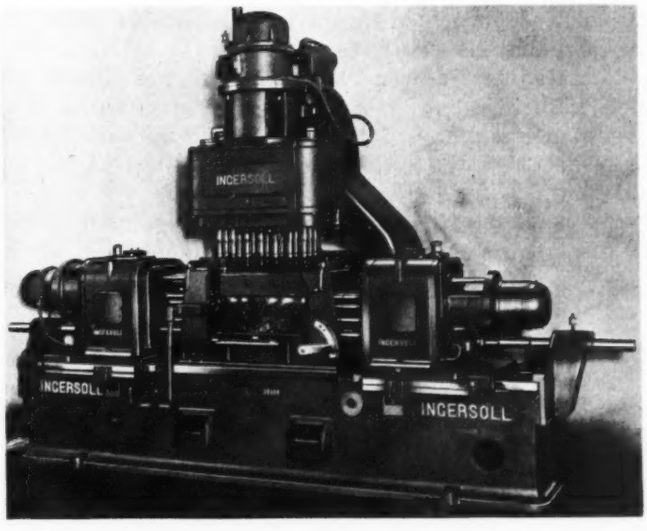
WHEN individual motor drives were first applied to machines that had formerly been grouped together and driven from a line-shaft, it was necessary to mount the motors on a separate foundation, since no place was provided for them on the machine. It is now generally realized that, for many types of machinery, decided advantages are gained by mounting the motor on the machine close to the unit it is to drive. When a machine performs two or more operations, it is usually preferable to apply individual motors for each separate operation.

The practice of mounting the motor on the driven machine imposes the requirement that the motor must withstand any vibration resulting from the operation. The first consideration is to make certain that strict alignment will be maintained between the motor and the driven unit. Any misalignment, except a slight one, such as is permitted by flexible couplings, will impose strains on both the driving and driven units, causing friction and undue wear.

Formerly, the mechanical construction of the motor was not always such that it could readily be adapted for side or overhung mounting on the driven machine. Hence, the machinery designer could not always get the rigidity and strength required for the application without providing some auxiliary support or bracing for the motor. The modern electric motor, however, will maintain accurate alignment while supporting its own weight and transmitting its torque when overhung or side-mounted on the driven machine.

With the assurance that the motor itself has ample strength and rigidity, it is practical to choose any method of mounting the motor that will meet the particular requirements of the individual application. Other considerations are compactness and pleasing appearance. The machinery manufacturer may elect to purchase a motor with a single bearing, or without any bearings, building in the motor as an integral part of the driven machine. Fig. 1 shows a single-bearing motor, side-mounted. This type of mounting has enabled the machinery builder to construct a complete unit with the motor in a position to apply its power directly to the work it has to perform.

Fig. 2. An Ingersoll Drilling Machine that Can be Moved without Disturbing the Alignment of the Fan-cooled Motors



Features of Flange-Mounted Motors

Flange-mounted motors are now being used quite extensively. The mounting dimensions on the flange and the shaft extensions for these motors have been standardized. In mounting a flange-type motor, or one of similar construction, a true alignment can be readily secured. This is made possible by centering the motor bracket from the bearing bore, after which the fit for the flange is machined, thus insuring that the motor shaft center is concentric and square with the machined

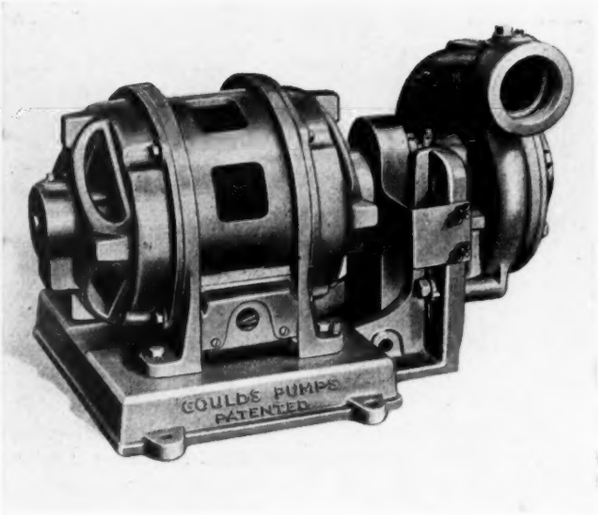


Fig. 3. Motor Installation on a Goulds Pump, which Permits Impeller to be Mounted on Extension of Motor Shaft

fit of the flange. The continued successful operation of motors mounted in this fashion is assured, due to the ease with which alignment is attained and maintained.

Fig. 2 shows three flange-type motors mounted on a drilling machine; two of these are mounted horizontally, while the third motor is mounted vertically. This arrangement permits the motor to be applied directly to each individual drilling head. The motors occupy practically no additional space beyond that taken by the machine.

Arrangement of Close-Coupled Drives

The standard two-bearing motor is used more extensively than any other type, but it is often desirable to mount these motors on the machine close to the driven unit. A unique arrangement, whereby a standard motor is close-coupled to a pump, is illustrated in Fig. 3. It will be observed that this unit requires the minimum amount of floor space. Positive alignment is maintained by dowels, the entire unit being assembled by the pump manufacturer before shipment. This makes the unit easy to install, since it is unnecessary to align the motor with the pump in the field, and the purchaser or contractor is required to provide only one foundation for the pump and motor.

Motors Applied to Portable Machines

When motors are permanently mounted on the driven machine or on a common bedplate with the drive, the entire unit can be easily moved about the plant as conditions require. When the machine is placed in a new location, there is no delay or extra work necessary, except to plug the motor in or reconnect it to the power lines.

Why Springs Have Their "Set" Removed

By FERDINAND HINTZ

The term "removing the set" or "setting" is used by spring makers to designate the operation of giving a spring an initial deformation, which is done by stressing it beyond its original elastic limit.

Many people, including engineers, ask: "Why do you remove the set?" Paradoxical as it may seem, the answer, in a few words, is: "Stressing the spring beyond its original elastic limit raises its ultimate elastic limit."

To induce this over-stress, compression springs are made longer than the required free length of the spring and then compressed solid—that is, until the coils touch. It will be found that if the stress is carried beyond the original elastic limit, a permanent deformation takes place, and the length of the spring after being released will be less than the original length. However, the spring may now be stressed considerably above its original elastic limit without taking any further set.

A practical example will illustrate how and why springs have their set removed. Suppose a spring is to be made of wire, the torsional elastic limit of which is 110,000 to 120,000 pounds per square inch, and the specifications are as follows:

Wire diameter, 0.135 inch; outside diameter, 1 1/4 inches; total coils, 12; active coils, 10; free length, 5 inches; ends squared and ground. The spring is to carry a load of 75 to 105 pounds without taking a set.

In order that this spring shall be able to carry a load of 105 pounds without taking a set, it is necessary to "remove the set," which is done by making the spring of such length that when compressed solid and then released, it will return to the required length of 5 inches.

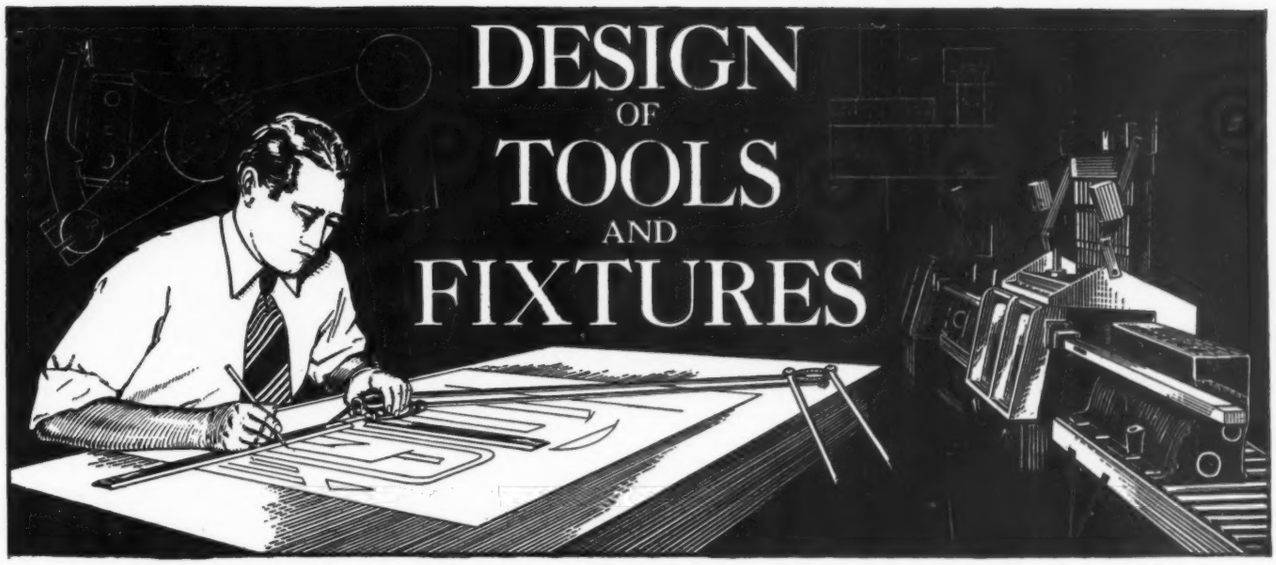
The stress in this spring under a load of 105 pounds, using Wahl's curvature correction factor, is approximately 143,000 pounds per square inch, which is considerably above the elastic limit of the wire from which the spring was made; hence, it is evident that we have increased the elastic limit of the spring to over 143,000 pounds per square inch.

Springs subjected to bending are treated in the same manner—that is, by making the free position such that they will return to the desired position after being subjected to over-stress.

The set is removed after the spring has been hardened and tempered or, if made of hard-drawn or tempered material, after the spring has been annealed to a straw color.

* * *

During the last five years, 3500 miles of railways have been built in the Soviet Union, increasing the total length of the railway system from 47,500 miles to 51,000 miles.



Double-Acting Clamp for Milling Fixture

An important feature of the milling fixture shown in the accompanying illustration is the clamping unit, which is so constructed that both clamps *A* are operated by one cam *B*, the pressure thus being equalized. The clamps pivot on pins *C* and are held in the open position, indicated in the view to the extreme left, by means of springs *D* acting on pins *E* through slots *F* in beam *G* when the low point of cam *B* is in contact with the beam.

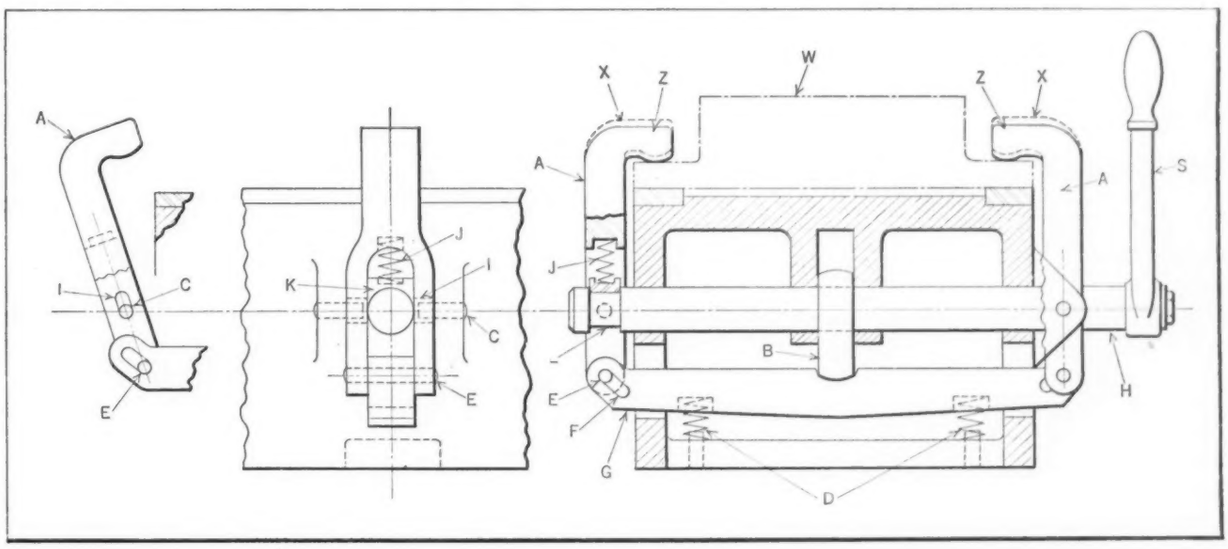
Springs *J* keep the ends of slots *I* in contact with pins *C* when the clamps *A* are in the positions indicated at *X* or the open position shown in the view to the left. Retainers *K* for springs *J* are located in grooves *L* of camshaft *H*.

In operation, the initial rotation of cam *B*, through shaft *H* and lever *S*, moves clamps *A* to the position indicated by the dotted lines at *X* through pins *E* in slots *F*. Continued rotation of cam *B*, after the upper ends of slots *F* come in contact with pins *E*, serves to pull clamps *A* down on the work *W*, as indicated at *Z*. Unclamping is simply a reversal of the clamping cycle. R. P.

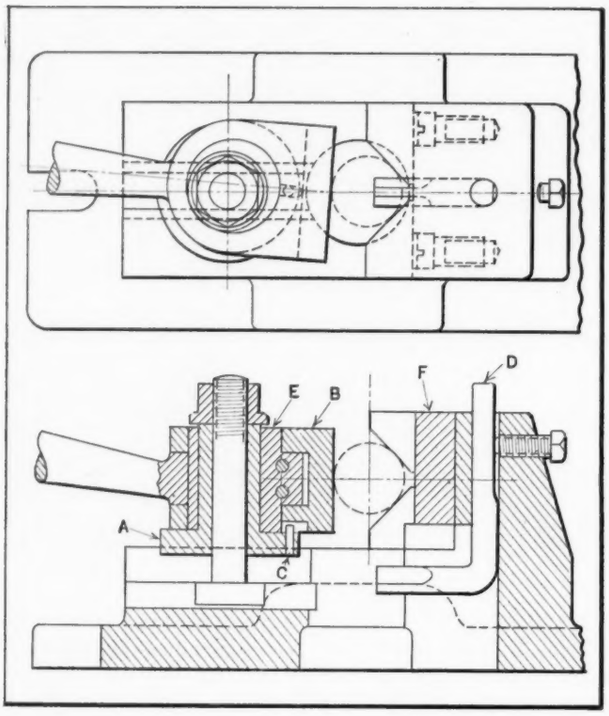
Adjustable Quick-Locking Vise

By A. WASBAUER

The vise shown in the illustration (page 166) can be used for a variety of production or tool-room work. It is intended primarily for end drilling, tapping, and milling operations on cylindrical parts. Provision is made for holding the work in either a vertical or a horizontal position. This vise can be made any desired size and is comparatively inex-



Fixture with Equalized Clamps A that can be Moved from the Open to the Closed Clamping Position by One Movement of Lever S



Quick-locking Vise Designed to Hold Cylindrical Work in Either a Vertical or a Horizontal Position

pensive to construct. It is quite rigid, owing to the large seating surface of the post *A*.

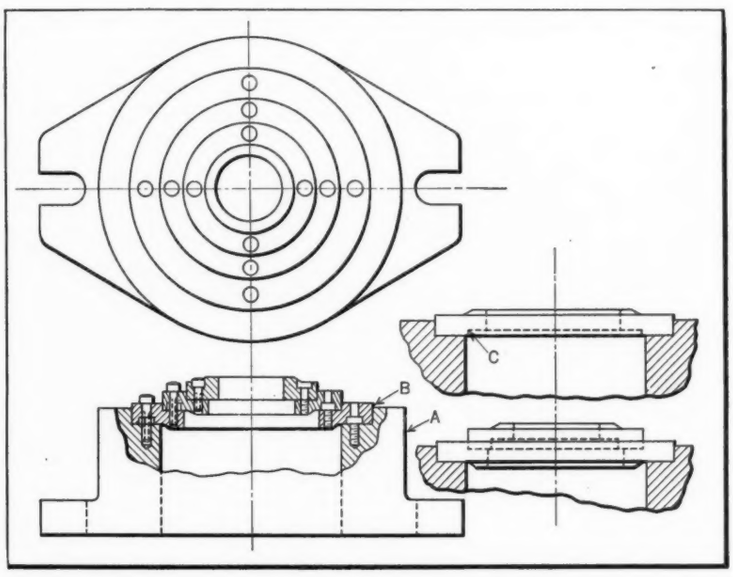
The jaw *B* is kept from turning by a pin *C*, driven into the post and projecting into a slot in the under surface of the jaw. If desired, an adjustable end-stop *D* can be provided. Other stops can be easily devised for special purposes. The eccentric sleeve *E* can either be doweled or keyed to the operating lever. This vise can be adapted for many uses other than the ones suggested by fitting it with special jaws *F*.

Assembling Three Sizes of Piercing Dies on One Bolster

By H. R. SCHMIDT, Philadelphia, Pa.

In cases where large holes of various diameters are to be pierced in sheet material, a considerable saving of time and material can be effected by constructing the die as shown in the illustration. The cast-iron bolster *A* is recessed, as shown at *B*, to fit the largest die of the series. Each die is recessed on the reverse side, as shown at *C*, and drilled and tapped to fit the next smaller die of the series. In other words, each die, when reversed, becomes the bolster for the next smaller die.

To change from a smaller to a larger size, it is merely necessary to remove the dies not wanted, reverse the required die, and change the punch on the punch-holder. This operation can be performed without removing the bolster from the press. A punch with the conventional spring stripper is used with this type of die. The two views to the right show the set-ups for the two larger sized holes.



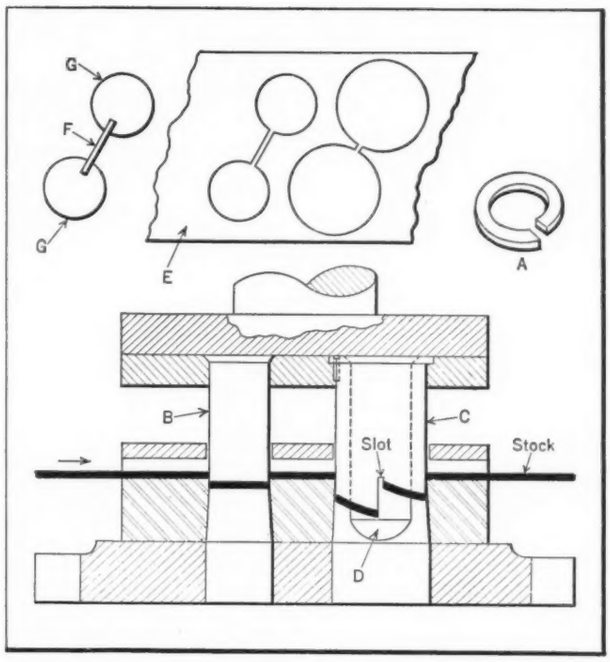
Arrangement by Means of which Three Sizes of Piercing Dies are Assembled on One Bolster

Die for Producing Lock-Washers

By EMIL GERHART, Philadelphia, Pa.

Lock-washers of the type shown at *A* in the illustration (see next page) are produced from phosphor-bronze strip stock 1/8 inch thick on a punch and die that pierces the hole at one position and performs both forming and blanking operations at a second position. Referring to the lower view of the illustration, punch *B* pierces the center hole, after which the stock is advanced to the second position, where the washer is blanked and formed to the shape shown at *A* by the punch *C*. This punch has a pilot *D*, which enters the previously pierced hole and holds the stock in place while the helical-formed end of the punch *C* performs the forming and blanking operation.

In the case of the lock-washer shown at *A*, which has an outside diameter of 2 inches, an inside diameter of 1 1/4 inches, and a thickness of 1/8 inch, it was found by experiment that the helix on the end of punch *C* was required to have a lead of 1/2 inch in order to take care of "spring back." While the section view of the punch and die shows only two punches, the die was actually constructed with four punches, as indicated by the view of the scrap stock at *E*. With this arrangement, two washers



Two-stage Die that Pierces, Blanks, and Forms Lock-washer Shown at A

are produced at each stroke of the press. The slotting punch *F* that connects the piercing punches *G* produces a slot in the middle, which comes in line with the slots in the forming and blanking punches. The piercings or slugs produced by punches *B* are forced downward and out through holes in the base of the die. The formed and blanked lock-washers *A* are also ejected in the same manner.

Shear Blades for Cutting Off Channel Sections

Shear blades, when shaped and mounted as shown in the accompanying illustration, provide a convenient means for cutting to length channel sections such as shown at *W* without distorting the work. Referring to the illustration, *A* is a cast-iron base and *B* is a slide held with gibs as shown. The springs *C* hold the slide in the "up" position against the stop *D*. The hardened steel shear blades *E* have U-shaped openings that permit the work to slide through freely. The hardened steel block *F* is attached to slide *B*. The blade in the slide is made somewhat smaller than the recess in order to permit adjusting the blade so that the openings will be in line.

The openings are machined in the blades at such an angle as to present the shortest cut through any point of the section. In the section shown, the sides, being at right angles to the bottom, are located at an angle of 45 degrees.

The unit is mounted in a punch press and used in much the same manner as a punch and die. A round piece of steel *G*, gripped in the ram of the press, strikes the hardened block *F* and moves the ram a distance somewhat greater than the thickness of the metal to be sheared. H. R. S.

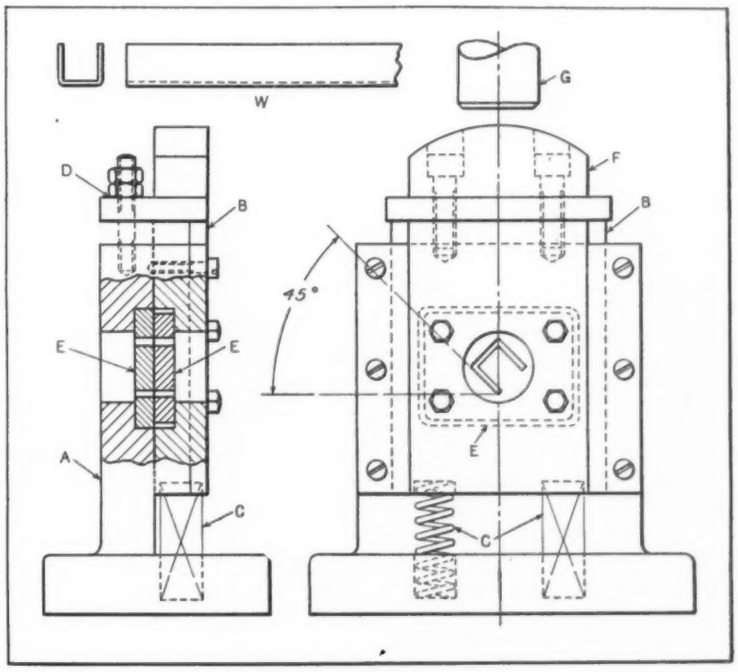
Quick-Acting Chuck Used in Grinding Concentric Bores in Sleeve

By F. P. SMITH

The grinding of the concentric bores *X* and *Y* in the sleeve *W* shown in the lower right-hand corner of the illustration on page 168 presents a work-holding problem. These bores must be ground in the same set-up, and the clamping pressure on the sleeve must not produce any perceptible distortion. In addition, production requirements necessitate rapid and convenient loading and unloading. The illustration shows how the chuck or fixture was designed to meet these requirements.

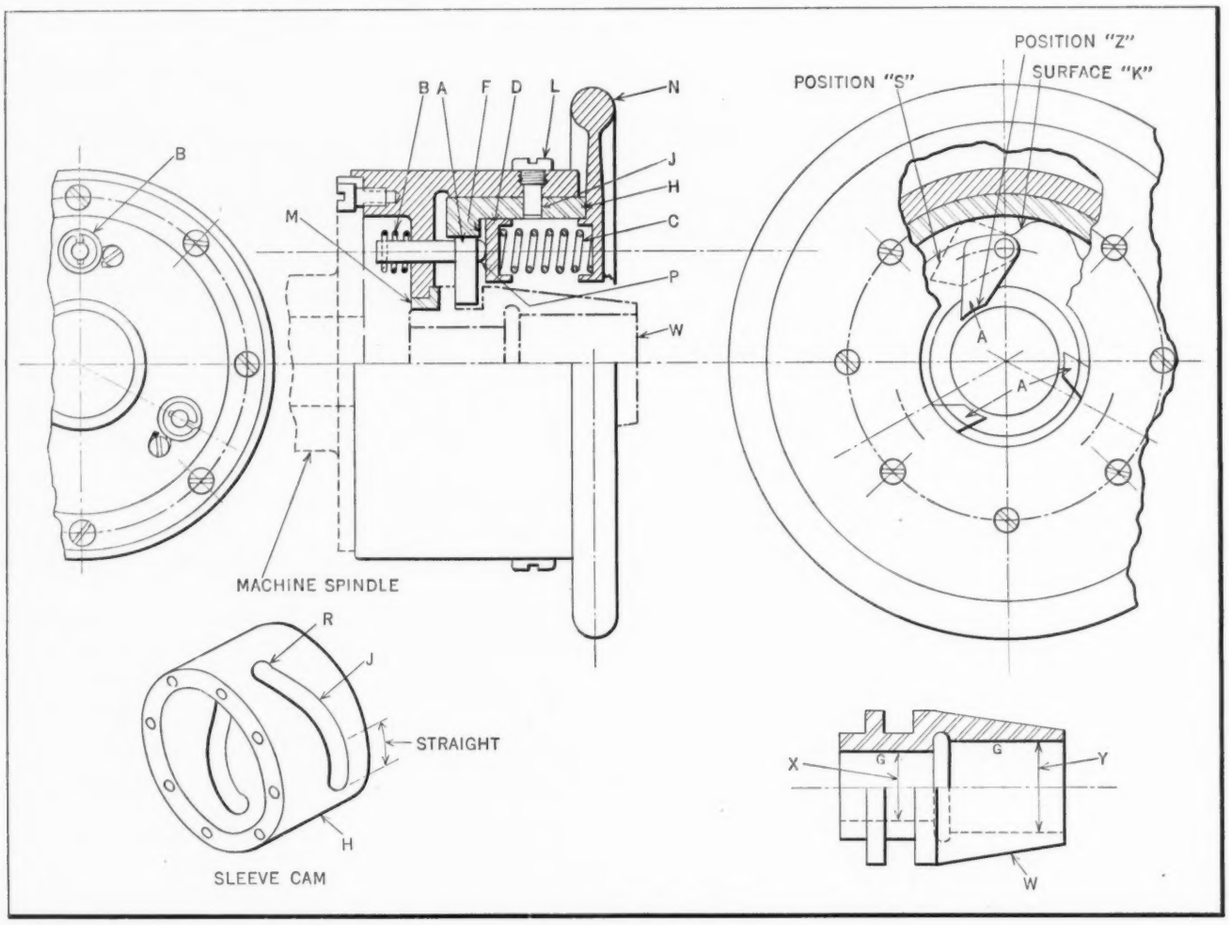
Each of the three equally spaced clamps *A* is normally held in position *S* by means of the combination torsion and tension spring *B*. Spring *C* keeps the pressure plate *D* pressed against shoulder *F* of the sleeve cam *H*, which is fitted with spiral slots *J* and the cam surface *K*. Pins *L* operate in slots *J*.

In operation, the work is inserted in bushing *M*. Sleeve *H* is then rotated clockwise by means of the



Shearing Tool Used in Punch Press for Cutting off Channel Stock

handwheel *N*. The initial portion of the rotational movement, in which the straight (not spiral) portion of slot *J* is in contact with pin *L*, causes cam surface *K* to swing clamp *A* into position *Z*, where it enters the annular groove in the work. Continued rotation of the handwheel advances sleeve *H*, bringing the pressure plate *D* into contact with surface *P* of clamp *A*, thus compressing spring *C* and clamping the work in place. The end of slot *J* is slightly notched at *R*, so that when the end of the slot strikes pin *L*, spring *C* will react sufficiently to prevent unclamping, due to vibration. Accurate control of this clamping pressure due to proper calibration of spring *C* is one of the important features of this fixture.



Chuck with Quick-clamping Arrangement Used in Grinding Bores X and Y of Part W

* * *

Our methods of taxation are mediaeval. The Government, like the feudal lords of the past, takes wealth for its use wherever it can be most easily taken, without any regard to whether the Government has any justifiable right to that wealth whatsoever. The principle that taxes should be paid in exchange for services rendered has entirely been lost sight of in present-day civilization.

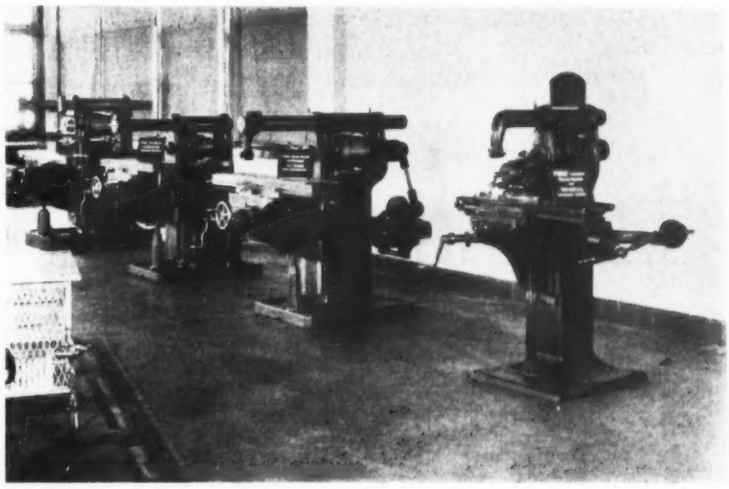
Higher Wage Rates Versus Higher Annual Income

An informative booklet entitled "The Fallacy of Higher Wage Rates" has been published by Allen W. Rucker, in collaboration with N. W. Pickering, president of the Farrel-Birmingham Co., Inc., Ansonia, Conn. In this booklet, a study is presented of the relationship of wages to production. The data from official sources given in the booklet directly challenge the confused thinking of the theorists who are at present shaping our economic course. These theorists ignore the plain lessons of past industrial experience. Their attempt to increase wage rates and at the same time to curtail production is an economic fallacy that already has shown its repercussions in higher prices, accompanied by a shrinkage in purchasing power, restricted employment, and delay in the natural processes of recovery.

Higher wage rates and curtailed working hours do not increase the annual dollar income of wage earners. Business history shows only one way to increase the worker's income and purchasing power. The booklet tells what this way is. A nation can have no more than it produces.

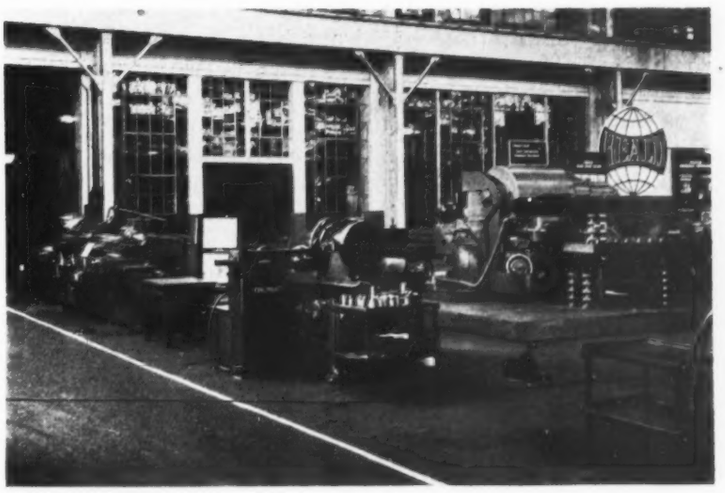
Cincinnati Milling Machine Co.'s Fiftieth Anniversary Exhibition

DURING the week of October 8, the Cincinnati Milling Machine Co., Cincinnati, Ohio, staged a most unusual fiftieth anniversary celebration, commemorating the founding of the company in 1884. It will be recalled that in January MACHINERY, page 292, an article was published reviewing the history of the company during the past half century. The fiftieth anniversary was marked by an exhibit, arranged at the company's plant in Cincinnati, to which their customers and friends throughout industry were invited. This exhibit comprised not only a demonstration of the latest products of the Cincinnati Milling Machine Co. and Cincinnati Grinders, Incorporated, but an historical exhibit as well, indicating the progress in the design of the company's milling and grinding machines from the early types up to the latest machines. The first Cincinnati milling machine built headed the list of the historical exhibit, followed by a number of milling machines and tool-grinding machines in chronological order.



(Above) Part of the Historical Exhibit, Showing in the Foreground the First Cincinnati Milling Machine Built. (Left) A Permanent Exhibit where Milling Machines and Grinders are Demonstrated to Visitors. (Below) The Heald Exhibit at the Plant of the Cincinnati Milling Machine Company

In addition to the exhibits of the Cincinnati Milling Machine Co. and Cincinnati Grinders, Incorporated, the Heald Machine Co., Worcester, Mass., had an exhibit of its grinding and precision boring machines. Practically all of the machines on exhibit—those of the Cincinnati Milling Machine Co., Cincinnati



Grinders, Incorporated, and the Heald Machine Co. —were shown in operation, doing regular commercial work. Fully a thousand visitors viewed the exhibit. Among these were the chief mechanical executives of almost all the large machine tool using plants throughout the country.

In commemoration of the fiftieth anniversary, and as a tribute to the late Frederick A. Geier, through whose leadership the company has become one of the outstanding machine tool building organizations in the world, a dinner was given at which were present a great many of the machine tool builders throughout the country, as well as other executives engaged in the machine-building and business fields. On this occasion, Ralph E. Flanders, president of the Jones & Lamson Machine Co., made the principal address on the subject "Industry's Part in Social Progress." This address will be found on page 173 of this number of MACHINERY. Other speakers paid tribute to the courage and leadership of Frederick A. Geier, who for so many years was its head, and extended wishes for the continued success of the Cincinnati Milling Machine Co.

The Norton Company's New Plan for Apprentice Training

Abstract of a Paper by H. W. Dunbar, Manager of the Grinding Machine Division of the Norton Co., Worcester, Mass., Read before the Annual Convention of the National Machine Tool Builders' Association

A FEW months ago, in taking an inventory of personnel requirements, the Norton Co. recognized that most of the applicants for jobs were unskilled and had never applied themselves for any length of time to any particular training. Recognizing, as well, that the most promising of the younger men in the organization were those who had been trained some five to ten years ago in the regular apprentice training course then in effect, it was decided to revive this apprentice course, changing it to apply to present conditions.

The new training course now applied is of eighteen months' duration. The apprentice is assigned to one of the departments in the shop and receives specific training in some branch of machine work—milling machine operation, boring mill work, or lathe work, for example. At the end of each working day all apprentices spend one hour in a classroom, listening to a lecture on machine work by some man in the organization.

Before the course is completed, each apprentice spends a few days in the other departments of the shop, so that he may have an opportunity to see various types of machine tools in operation and become acquainted with them in a general way. The real objective, however, is to train a man in some one line of work, although he spends some time in the tool-crib and part of his time as utility man or as clerk to the foreman, besides actually working on a machine.

Applicants for the apprenticeship course must be at least sixteen years old, and boys about eighteen are preferred. They must possess the equivalent of a grammar school education, be mechanically inclined, and present a good appearance.

The selection of boys has proved to be somewhat of a problem, because in these days, it is obvious that there are many applicants for the few apprentice places being offered. For this reason, the selection is determined not by any one man, but by a committee consisting of the chief engineer, production engineer, equipment engineer, sales manager, two general foremen, and the manager of the machine division.

The applicants are interviewed individually, and great care is taken to outline the course, so that there will be no misunderstanding. Questions are asked each applicant, and from the manner in which he answers, his alertness, attentiveness, ambition, previous experience, habits, and other characteristics can be determined. Each man on the selection committee presents his opinion in writing at the committee meeting. On the basis of these opinions, the boys are selected, and there is little chance of selecting the wrong boy.

A written agreement is signed by each apprentice, his parents or guardian, and the Norton Co., so that there will be complete understanding between all concerned as to the scope of the course, the pay, and the rules and regulations. The first two months constitute a trial period during which either the boy or the company may terminate the contract. After that, the agreement is expected to be binding.

As mentioned, there is a lecture period of one hour each day. The lectures cover engineering in general, tools, materials, jigs and fixtures, planning

methods, inspection, and shop mathematics. General instructions are given in how to read engineering drawings, with some practice in the use of drawing instruments, but there is no effort to make draftsmen out of these apprentices; it is merely expected that they should have a good working knowledge of engineering drawings.

The lectures on tools are given by the various foremen and cover such subjects as the center punch, calipers, micrometers, the sine bar, and indicators. The reading of drawings and the lectures on tools cover most of the classroom time, although a few weeks are spent on the other subjects, especially on shop mathematics, where simple problems are solved on gear ratios, pulleys, and levers, and where the principles of geometry are explained.

How Much Does This Training Cost?

It is evident that in these days the manufacturer will ask "How much does all this cost?" The cost is really very small. It is expected that the boys will earn in the shop, through their daily work, the pay that they receive. Therefore, the only direct cost is the expense of the classroom instruction. Since the lectures are given entirely by men on the company's own staff, the cost per boy, with eight apprentices in training all the time, is somewhat in the vicinity of $40 per boy.

For those who may be interested in the training of apprentices it might not be out of place to mention that permission must be granted by the Code Authority before a company may proceed to engage in apprentice training. The Norton Co.'s experience indicates that a program such as outlined meets with the approval of the Supervisory Agency; in fact, it has been enthusiastically encouraged.

* * *

Gear Manufacturers Meet in Milwaukee

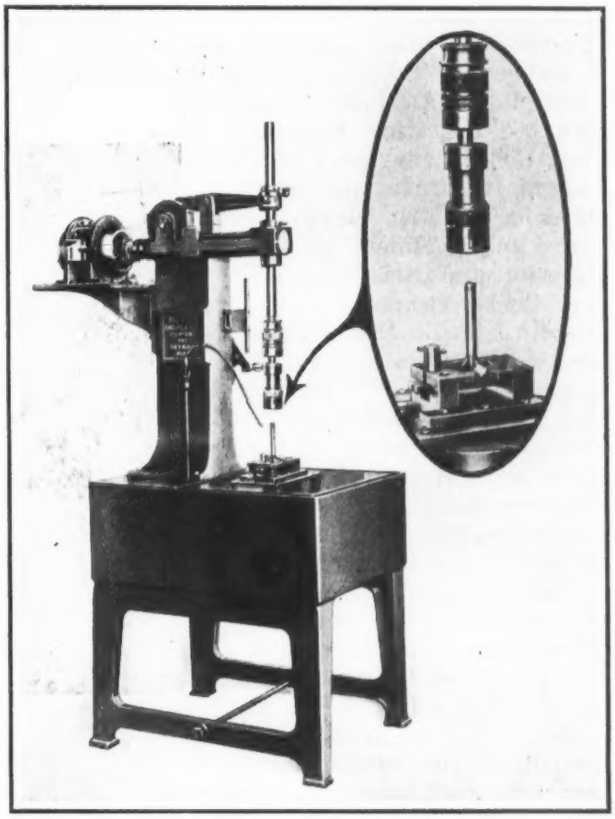
The seventeenth semi-annual meeting of the American Gear Manufacturers' Association was held at the New Pfister Hotel in Milwaukee, Wis., October 22 and 23. As usual, the main sessions of the meeting were devoted to standardization problems.

At the first session, the president, John Christensen, president of the Cincinnati Gear Co., addressed the members, calling attention to matters of current importance in the gear manufacturing field. Other papers and addresses read at the meeting were as follows: "Modern Methods of Transmission", by P. C. Day; "The Advantages of Sykes Herringbone Gears", by W. E. Sykes; "The Fallacy of Price Cutting as a Basis of Getting Sales", by Paul Christensen; "Helical and Straight Spur Gears", by Professor F. A. Mickle; "Bevel Gears with Helical, Curved, and Straight Teeth", by F. E. McMullen; "Good Steel Foundry Practice in Gear Manufacture", by Arthur Simonson; and "Welded Steel Construction", by Thomas Holloway.

Honing Applied to External Surfaces

The honing of bores and small holes to a high degree of finish and accuracy over a period of years led the Hutto Engineering Co., Inc., 515 Lycaste Ave., Detroit, Mich., to develop honing for the finishing of outside surfaces as well. The illustration shows the stem of airplane-engine valves being honed by the new method to within a tolerance of ± 0.0001 inch.

The abrasive members of the external hone are expanded and contracted by means of an external adjusting sleeve. The hone itself is of simple design, with the abrasive members totally enclosed.



External Honing Being Applied for Finishing the Stem of Airplane-engine Valves

Kerosene is supplied copiously during the honing operation to cleanse the abrasive stones and cool the work. An oil-retaining collar and baffle plates insure that the kerosene is directed to the desired points. The machine illustrated was designed expressly for honing light parts.

In addition to valve stems, external honing is applicable to such parts as bushings, wrist-pins, push-rods, pistons, piston-rings, and roller-bearing races, which must be produced to within a close tolerance as regards straightness and roundness. As in the case of internal honing, any degree of finish can be given to external surfaces by using abrasive stones of the proper grit.

Machine Tool Builders Adopt Resolution on Re-Employment

At the thirty-third annual convention of the National Machine Tool Builders' Association, held at Atlantic City early in October, several addresses keenly analyzing present-day industrial conditions were presented, and much attention was given not only to the problems facing the machine tool industry, but also to those confronting the industries of the United States in general.

In opening the convention, the Association's president, E. A. Muller, president of the King Machine Tool Co., briefly reviewed present conditions and tendencies in industry. Dr. Virgil Jordan, president of the National Industrial Conference Board, clearly and concisely reviewed the government's relation to industry in an address entitled "The Road Map of Recovery for 1935." The general manager of the Association, Herman H. Lind, in a comprehensive report, gave a specific and detailed review of the effect of code provisions and governmental regulations on the machine tool industry. An abstract of Mr. Lind's address will be found on page 145.

Charles J. Stilwell, Newly Elected President of the National Machine Tool Builders' Association

Impressions of Europe and the outlook for foreign business were dealt with in brief addresses by E. A. Drissner of the National Acme Co. and C. J. Stilwell of the Warner & Swasey Co. Howard W. Dunbar of the Norton Co. read a paper outlining in detail the Norton Co.'s plan for apprentice training. This paper is abstracted in an article on page 170 of this number. Robert M. Gaylord of the Ingersoll Milling Machine Co. presented a very informative report as the Association's representative to the Machinery and Allied Products Institute.

The Association adopted the following resolution on the question of national recovery and re-employment:

"We, the National Machine Tool Builders' Association, assembled in our thirty-third annual convention, affirm our conviction that national recovery can only be brought about by re-employment in the Durable Goods Industries.

"The people of a nation can have no more than they produce. As makers of the basic machines for production, the members of this Association emphasize the fact that the standard of living of a nation is measured by its effective use of machinery. Nowhere else in the world is machinery utilized to the extent that it is in the United States, and nowhere else does the average man enjoy as many conveniences and comforts. Witness the 23,000,000 automobiles, the 19,000,000 telephones, the more than 5,000,000 automatic refrigerators, the many millions of radios, and the countless other products which the efficiency of the machine has put within reach of the average man—products that are luxuries in other countries.

"Because of these basic and generally known facts, the National Machine Tool Builders' Association, by formal resolution, hereby endorses the Report to the President of the United States on National Recovery and Employment presented by the Durable Goods Committee on May 14, 1934.

"We recommend to the President, to Congress, and to the Recovery Administration the most serious consideration of this report, and especially the fundamental conditions necessary to recovery and re-employment stated therein. To these fundamentals, for the attainment of the best interest of the greatest number, we subscribe."

The following new directors were elected: Clayton R. Burt, president and general manager, Pratt & Whitney Co.; Eugene C. Clarke, president, Chambersburg Engineering Co.; and H. C. Pierle, secretary and sales manager, R. K. LeBlond Machine Tool Co. The new officers are: President, Charles J. Stilwell, vice-president, Warner & Swasey Co.; first vice-president, Norman D. MacLeod, president and general manager, Abrasive Machine Tool Co.; second vice-president, Clayton R. Burt, president and general manager, Pratt & Whitney Co.; and treasurer, H. H. Pease, president, New Britain-Gridley Machine Co.

Industry's Part in Social Progress*

The Place of Industry in the Scheme of National Welfare Has Been Greatly Misunderstood, and Its Importance in Any Plan of Re-Employment Underestimated. Mr. Flanders, Whose Searching Address on the Subject is Here Abstracted, Points the Way to Real and Lasting Recovery

AT this moment, all of the productive and constructive elements of this nation are engaged in a common task and are working toward a common end. But the task before us and the ends we seek are seen in different aspects by different units of the cooperating groups. For some, the ends are obscured in a devotion to the means employed; for others, the ends are so vast that they are magnificently vague, and the means are indeterminate.

These things being true, it is no wonder that we have the appearance of a nation working frantically at cross-purposes. Some are intent on raising prices; some, on lowering prices; others, on price fixing. Some would increase working hours; others, decrease them. Some would cut governmental expenditures; others, expand them. Some would take land out of agricultural production; others—or even the same persons—would initiate irrigation projects which will increase the crop yield. Some call for a closer governmental or industrial control; others plead for more freedom.

Confronted as we are by this confusion, we must in the first place seek some clear statement of our purpose—a statement which will be broad enough to be generally acceptable, yet deep enough to have a content of vital social meaning. It must be an expression of purpose on which industry, agriculture, commerce, finance, and statesmanship must perforce agree. Let us attempt such a statement:

As our social objective in the material realm, we would provide for the mass of the population a scale of living which, on the whole, is continually rising and is free from severe or destructive fluctuations. In the spiritual realm, we would diminish the need for consuming anxiety among the body of the population, and would foster and preserve such elements of personal liberty as are not in conflict with the preceding purposes.

We Must Learn to Distinguish the Means from the End

It is highly important that we state our objectives and that we put them in terms of human values; for human values are the real objectives of a cooperative social undertaking such as that in which we are engaged. The purpose of our cooperation is not and cannot be the strengthening or defeat of a labor organization or of a political party, the return to the gold standard or the adoption of some kind of a managed currency, the expansion or contraction of the national debt, the increase of government-operated business undertakings or the withdrawal of government therefrom, the regimentation of industry or the encouragement of free competition, the raising, lowering, or fixing of prices or the price level. On all of these things and on many more of similar importance each of us holds strong views. But is there any one of us who would not willingly change our views and seek means of corresponding changes in business and financial practice, if it became clear that we could thereby more readily and safely gain our common social ends?

These other matters, important though they be, are only means to an end, not the ends themselves. We can the more easily view them with an open mind and enter into the necessary adjustments and compromises relating to them if we recognize them as means, not ends.

The First Requisite for a High Standard of Living is Production

Let us consider the first element in our stated purpose, expressed in these words: "As our social objective in the material realm, we would provide for the mass of the population a scale of living which on the whole is continuously rising, and is free from severe or destructive fluctuations."

Now the scale of living is determined by the volume and quality of goods and services placed at the disposal of the individual. The provision of these goods and services is the task for which industry is organized—it is the reason for its existence.

Our objective requires that more and better goods and services be provided and distributed. Higher and even higher production is the direct and primary means to this end. Those of us who are in industry, and particularly those of us who devise and provide the tools of industry, have no doubt in our minds as to the physical possibility of

*Abstract of an address by Ralph E. Flanders, president of the Jones & Lamson Machine Co., Springfield, Vt., and president-elect of the American Society of Mechanical Engineers, presented before a prominent group of manufacturers at the fiftieth anniversary celebration of the Cincinnati Milling Machine Co., October 12, 1934.

continuing this improvement in the scale of living which has been in progress for the last century and a half. The improved machines and advanced forms of organization are here, and further progress is in sight. Why should we not move forward?

Who is Responsible for Our Slow Progress?

The responsibility for our delay cannot be placed wholly on the shoulders of any one person or group. Government, labor, and industry itself will have to share the blame.

Business, until very recently at least, has been fascinated by programs of production control, price fixing, and other practices aiming toward assurance of profits but ignoring this primary need for more goods and services. In fact, these programs work for fewer goods and services, and thus for a lower standard of living. Such policies will not even give that assurance of profits which is their purpose. They will only assure ever-shrinking profits on a shrinking volume of business and a lowered scale of living.

As to the Administration, we have already noted that its policies have been numerous and conflicting. With one hand it has sought to raise prices, and with the other to lower them. It has sought to expand business operations and business credit at the same time that its really effective agents in legislation and administration were seeking materially to diminish business profit. For political purposes it has given its preponderant support to one type of employer-employe relation—the labor union—even though conventional union policies tend away from, rather than toward, the objective we all wish to attain.

In seeking to correct the faults that stand in the way of recovery, we find false conceptions in all of the groups; but the major misconceptions appear to lie in the inability to realize that more goods and services, rather than changes in hours and wages, is the essential thing; and in the failure to appreciate the function of profit from productive business as the effective provider of this plenty and of the increased employment by which this plenty is distributed.

Let us pause at this point to emphasize something of very great importance. It is required by the conditions through which we are passing that industry make plain to itself its relations to the social problem, doing it honestly and realistically. Having done so, it is required that it shall speak out clearly, directly, and without reserve, not only as to its own functions and duties, but with relation as well to the function of its partners, labor and government. There is no substitute for clear thinking and plain speaking if we are to make progress toward our social goal.

There is perhaps no better way to approach this aspect of our problem than to study the official view of the American Federation of Labor, presented in the annual report of its Executive Council, and published in the *New York Times* October 1. It is too long a document to read in full. An endeavor will be made to give a fair condensation, interspersed with comments.

> The volume of goods produced and the aggregate of services rendered is our real national income. In these terms, our economic history has been the history of swift and gigantic industrial growth. Along with almost constant acceleration in the rate of output went the steady expansion of the consuming power of the American people.

This opening sentence forms an excellent statement of the conditions productive of a rising standard of living.

> Following the collapse of our top-heavy debt structure in 1929, the real income of the nation began to fall off at a rapid rate.
>
> Today we have about five million more residents in the continental United States than we had in the predepression year. To provide for these additional millions of Americans on the 1929 scale, our production must exceed the volume attained in that year. This can be done only by reconstructing the efficiency and coordination of our entire economic system along new lines. With 10,000,000 wage-earners idle and with a large portion of our factories empty, we must be careful to insure a return to the predepression production levels, which would not be deceptive and temporary, but built upon the sound foundation of permanency.

In this statement, the labor leaders display an insight superior to those financial leaders who filled the depression years with their warnings that we were suffering from having lived too high—that never again must we produce and distribute as much as we did in 1928 and 1929. Of course, this is pure folly. Some individuals may have lived too high for their own good. Some speculative activities were pushed to disastrous limits. But the plain citizens of this country suffered from no surfeit of goods and services.

When Statisticians Disagree, What are the Facts?

> With unprecedented changes in mechanical equipment of industry, the problem of technological unemployment came to the fore following the World War.
>
> Even accepting the conservative estimate for this period made by Dr. Mills of the National Bureau (Frederick C. Mills, "Economic Tendencies in the United States"), we find that from 1919 to 1929, output per worker employed increased approximately 43 per cent. This means that work requiring one hundred men in 1919 could be done by seventy in 1929, and that thirty out of one hundred could be dispensed with.

Here the reasoning begins to go wrong. Why need these men be dispensed with? If we want more goods than we are now getting, they can make them for us. If we prefer more leisure to more goods, we can shorten the working day. But note that shortening the working day is not the way to get more goods. There is doubt about the facts, as well. Statisticians apparently do not agree. Data to be introduced later indicate that the industrial production per capita did not rise more than 20 per cent in that period, and that there was no increase in the percentage of unemployment to be reckoned with.

The years of business prosperity brought not only expanding production and rapidly increasing productivity, but also instability of employment and uncertainty of income to the wage-earner.

The tendency toward increased instability of employment, rather than an increase in unemployment, is one of the real evils of increased mechanization and of the uncontrolled operation of our credit money system. Here is a real field for improvement. It is possible both to decrease the instability and to protect the worker from what remains—possible, that is, if the profit system is permitted to perform its full social function.

According to figures of the National Bureau of Economic Research, between 1929 and 1933 the output of the worker per man-hour was increased 27 per cent.

A work week averaging about fifty hours in 1929 has been reduced to about thirty-eight hours in 1933, with the depressed rate of activity keeping the weekly hours well below the maximum prescribed in the NRA codes. This 25 per cent drop in weekly hours has reduced the total man-hours by 50 per cent since 1929. Under these circumstances, a 27 per cent advance in the output per man-hour is indeed striking.

These figures are rather startling, indicating, as they do, an increase per worker of more than 80 per cent since 1919. It is doubtful whether they constitute a fair section of industry or are taken from exceptional samples. One thing is sure. For business as a whole, this latest increase in efficiency was developed out of the necessity for keeping out of the sheriff's hands. It was the price of survival, not the source of profits.

Is Industry Wholly to Blame for the "Strains and Maladjustments?"

During the post-war decade, the volume of goods and services produced in the United States was being increased at a rate never before maintained for a similar period of time. But under this rapid acceleration in the rate of production, the economic system was showing definite strains and maladjustments.

We have every indication that too large a proportion of our productive resources was poured into the production of durable goods and especially of capital equipment. It is highly significant that the falling off in the production of durable goods and capital equipment was the most important factor in the decline of the productive rate during the depression.

Here the document, like nearly every other one of its kind, leaps to the purely gratuitous assumption that the "strains and maladjustments," and any unwise additions to capital goods, were derived from undue profits and from a serious maldistribution of wealth *in industry*. These phenomena did not appear *in industry*.

The strains and the maldistribution and the unwise provision of capital goods were derived from the billions of dollars of fallacious purchasing power injected into our economic system by credit based on speculation, and disastrously destroyed by the four years of inevitable deflation.

It is important to realize that in the post-depression period, the purchasing power of the consumer will be applied primarily to the acquisition of commodities most essential for human consumption. It will be some time, therefore, before we begin to increase savings—some time, in other words, before we begin to spend on a large scale for future incomes and thus supply investment funds necessary for new production of capital equipment.

We are thus faced with potential serious checks to reabsorption by the industry of those now unemployed.

This is a fair statement of the inexcusable condition into which current trades union and governmental policies have been leading us. It *is* going to be some time before we increase savings and supply investment funds for capital equipment; therefore, it is going to be some time before the main body of the unemployed, normally producing capital goods, are taken off the relief rolls and permitted to earn the good living which they are capable of earning. And this is because we have been willing to encourage anything except business profit, which is the only thing that can employ the unemployed in the depressed industries. Instead of fresh air, pure water, nourishing food, and exercise, we are treating business to dope, blood-letting and hypnotism.

There is Only One Way in which to Provide Purchasing Power

Further and substantial increases in wages for industrial labor must be made to encourage a demand for durable goods, as well as consumption goods.

Provided with adequate purchasing power, we can substantially accelerate the rate of production of goods and services.

And so we can. But why is purchasing power so shy? We raise wages, we "prime the pump," we cram the banks with credit. All is of no avail. The reason is simple. We are deficient in purchasing power. We are deficient in that principal element of purchasing power and *employing power* which is represented by credit money and is generated by bank borrowing for current business operations. That borrowing cannot and should not take place on an increasing scale until the prospect of business profit becomes hopeful. And this will be difficult until labor, while correcting local and specific injustices, develops for its major strategy something more constructive than mass attacks on slender and vanishing profits.

When labor permits, when government encourages, and when shrewd business takes a chance, there will be re-employment and rising real wages.

The Fallacious Doctrine of Shorter Hours of Work as a Road to Prosperity

There is ample evidence of the immediate and pressing need for a further shortening of hours of work as a first step toward stabilization of employment. The general adoption of a shorter work week is bound to bring a sustained industrial stability.

What a strange conclusion, presented *without* the evidence, and in the face of the introductory statement that a rising standard of living demands more goods and services! And what a direct blow at re-employment in the depressed industries, whose only hope lies in the reappearance of profits, which this policy would destroy!

A Statement of a Progressive Policy

Labor should be given an opportunity to join hands with the management in the great national enterprise of rebuilding our industrial economy on the basis of social as well as economic efficiency, and thus assure a return to prosperity more permanent and more equitable than we have seen.

To this all will agree. This past year I have had the pleasure and honor of meeting a number of the principal labor leaders of the country. It is impossible to make their acquaintance and not be impressed with their intelligence, honesty, and devotion to a worthy cause. If they can forsake their concentration on attractive, but shallow and ineffective means, and will join in a search for effective and practical ways of attaining such ends as were set forth at the beginning of the annual report quoted, they may demand that business take the no less difficult step of meeting them half way.

Statesmanship in Labor, joined to statesmanship in Business, will generate statesmanship in Government—and thus three vacuums will be filled.

What are the Facts?

There is no need here to go into an analysis of the underlying fallacies of the report quoted, or of the corresponding underlying trend of governmental attitude and policy which so faithfully follows it. That task has been done effectively by Colonel Ayres in the Cleveland Trust Co.'s Bulletin of September 15—a most remarkable document.

Colonel Ayres challenges and destroys the seven major economic fallacies; over-production, concentration of wealth, effectiveness of redistribution of income, high profit margins, taxation possibilities, effectiveness of inflation, and recovery through consumer purchasing power. Each point is illustrated by an illuminating diagram.

His diagram of per capita production shows that the increase from 1919 to 1929 was by no means out of line with the trend from 1900 onward. It represented a desirable rise in the scale of living, but gives no evidence of a general excess productive capacity. This rise in productivity is of the order of 20 per cent rather than the 43 per cent of the Federation report; nor was there any great decrease in employment to account for the discrepancy.

But perhaps the next diagram is still more illuminating. Again in 1929, if all wage earners had divided equally the total of wages actually paid, they would have received $119 a month each. If, in addition, the salaries, bonuses, dividends, and other shares of proprietors had been taken away and given to the wage earners, it would have given them only $12 more per month each, or just about a 10 per cent rise in wages.

That is all there is, but there is no reason why there can't be more in the future, resulting from a growth in real income, such as the worker has already experienced over the decades, but with that advance accelerated and steadied. The advance will be generated, as in the past, by a preliminary stimulation of profits in *industry* (not in *speculation*), which will find their way more surely than in the past into consuming power.

Why Doesn't Purchasing Power Come Back?

The diagram for purchasing power emphasizes what has already been said—that the greatest failure of purchasing power lies in the persisting unemployment in the durable and capital goods industries and in construction. In other words, unemployment is worst in the industries that depend for their activity on a revival of profit.

All of this clinches the argument. There is in productive business no inexhaustible fund of profit which may freely be drawn upon, in any given moment, to raise wages and supply new, expensive (and needed) social safeguards. And, finally, it becomes more and more clear that the solid road for our bogged industrial machine is the old and safe one of revived profits. Along that way lies re-employment and continuation of our progress to even higher standards of living.

Is There Evidence of Clearer Thinking Ahead?

What, then, shall we do? We have been discouraged and thwarted by the policies that have been proposed, accepted, and acted upon by Government, by Labor, and by some sections of Industry itself. These policies, based upon fallacies, have hitherto prevented the attainment of the reasonable hopes of our people as a whole. But there are clear evidences of a change in the wind.

As to Labor, the short-sightedness of its leadership is becoming evident to all. The mass of workers will not long remain content with the only fruit that traditional union policy offers—apples of Sodom, fair to the eye, but devoid of nourishment.

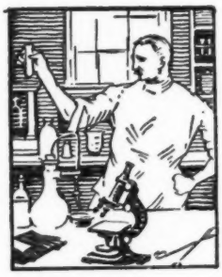
Industry is learning its lesson. There were apples of Sodom even in the NRA fruit basket. They do not satisfy, and better policies are being sought.

As to Government, the outlook is better than it has been at any time in the recent past. Faith in fallacies is waning. The Administration—including the President himself—appears to be in a more receptive mood for permitting Industry to tackle the job in its own normal way.

The effective way is the old way. Moderate, judicious, but widespread expansion of business enterprise is the stuff of which a safe recovery, a solid prosperity, is made. Nothing can take its place. The safe expansion of credit, of employment, and of purchasing power comes from a natural, unforced expansion of this type, made in the reasonable hope of expanded profits. On the expansion of these profits depends our only solid hope for large-scale re-employment.

On these profits, finally, depend the initiation and maintenance of those social services by which it is hoped to safeguard the worker from anxiety and want. There is no other source of support.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Boron Carbide—Next to the Diamond the Hardest Material Known

Boron—the basic element of boric acid—and ordinary carbon such as occurs in coke are now being combined commercially by the Norton Co., Worcester, Mass., into the hardest product that has ever been produced by man. Boron carbide, as the material is called, has a compressive strength of 260,000 pounds per square inch. It is unaffected by the strongest acids and alkalies, has a coefficient of expansion that is approximately two-thirds that of steel, is lighter than aluminum, and is little affected by heat up to temperatures of 1000 degrees C. (1832 degrees F.). Molded forms, drawing dies, and a beautiful black industrial diamond made from boron carbide were recently exhibited.

The new material has found an immediate use in the cutting and lapping of cemented tungsten carbides, and abrasive products for this purpose have been made available by the Norton Co. Because boron carbide can be melted into liquid form, it can be used for self-bonded articles that must be of great hardness.

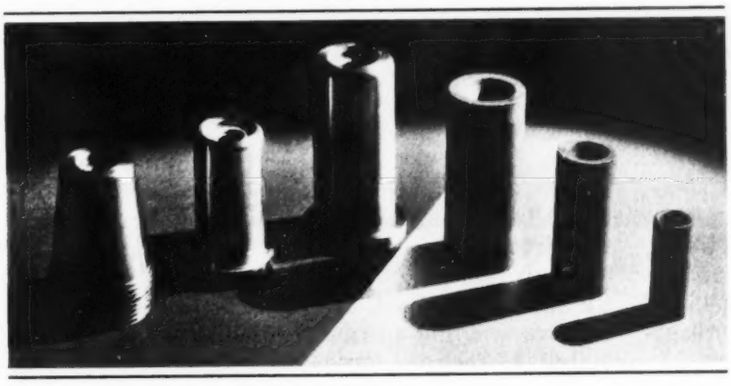
In the field of abrasive blasting by compressed air, the nozzle wear with the usual materials is so rapid that the cost of the nozzles is an important item. Also, because ordinary nozzles are cut so rapidly by the abrasive stream, the efficiency of blasting is greatly decreased with nozzle wear, and large volumes of air must be pumped to maintain the velocity of the stream toward the end of the nozzle life period. Pressure blast nozzles molded from boron carbide have many thousand times the wear resistance under blasting conditions of any metal previously used for the same purpose. It is estimated that in some cases one nozzle will last the life of a sand blast machine, where the nozzles now being used must be replaced within thirty minutes.

In the drawing of fine wire of all kinds, it is the practice to use large diamonds, which must first be carefully drilled, to produce wire of the desired size by drawing slightly larger wire through the drilled opening. Boron carbide can be used for this service and for extruding dies. Bearings of various kinds have also been made from boron carbide for widely different uses, such as in electric motors and for the high-speed spindles of grinding machines.

In making boron carbide, the purest medicinal boric acid is taken from the hottest place in the United States where human beings live—Death Valley. The extracted boron is shipped to Niagara Falls, where high-temperature electric furnaces convert it into an abrasive. A temperature of approximately 5000 degrees F. is used in this process.

"Fernico"—a Metal Alloy that Fuses with Glass

A metal alloy with a coefficient of expansion that is practically the same as that of certain types of glass has been developed in the Research Laboratory of the General Electric Co., Schenectady, N. Y.



Sand-blasting Nozzles and Nozzle Linings Made from Boron Carbide, which Rivals the Diamond in Hardness

This important property of "Fernico," as the alloy is called, enables it to be fused with glass. No stresses are set up in either the glass or the alloy fused with it when the materials cool from the fusion temperature, because the rate of contraction is the same for both. No more care need be taken in cooling the two different materials than when glass alone is being dealt with.

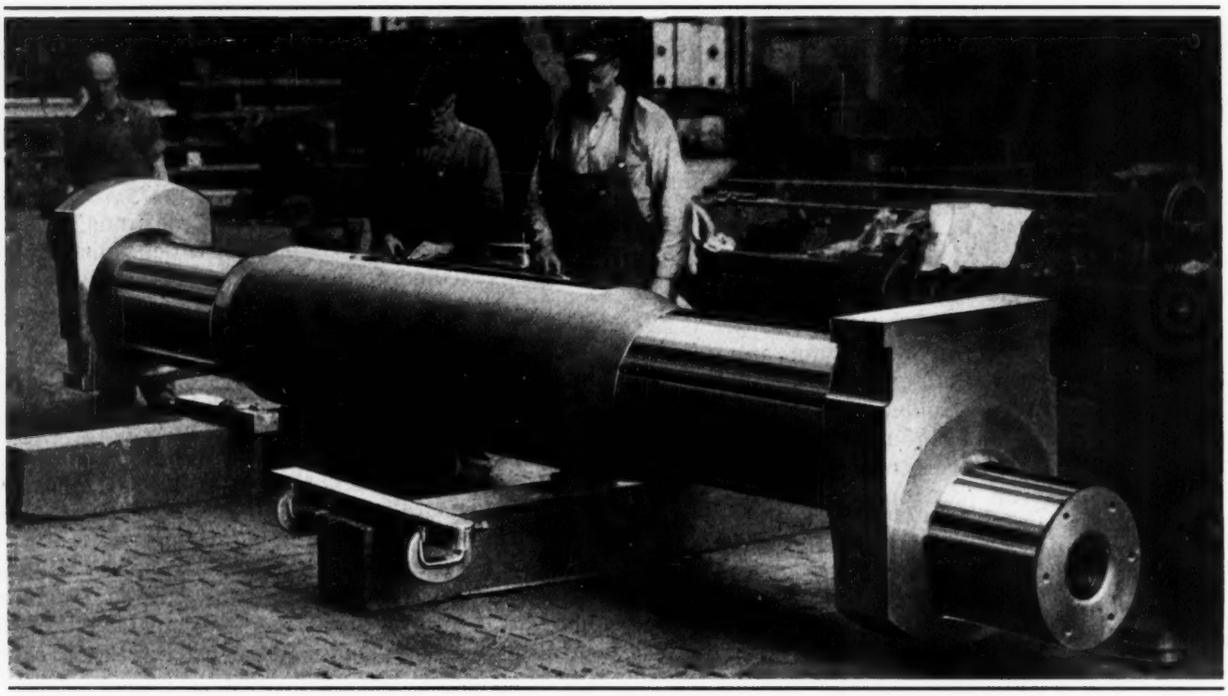
Fernico should be of advantage wherever tight joints are required between metal and glass, as in various vacuum tubes and other devices in which lead-in wires or conducting parts must pass through gas-tight insulating seals. The alloy can be machined, forged, punched, drawn, stamped, soldered, copper-brazed, and welded with a facility equal to that with which the same operations can be performed on a high-grade nickel iron.

Plykrome Pipe Withstands Friction from Compressed Air

Eighteen hundred feet of pipe ranging from 2 to 5 feet in diameter have been fabricated from Plykrome for use in the new Milwaukee sewage disposal plant. While Plykrome—a stainless-clad steel made by the Illinois Steel Co., Chicago, Ill.—has been widely employed for corrosion-resisting purposes, this is the first instance in which it has been used to reduce the friction of compressed air passing through a pipe.

In the preliminary engineering studies for this new sewage plant, it was found that if the air ducts were made of cast iron, they would have to be several inches larger in diameter than Plykrome pipe, in order to carry the necessary volume of air. This would have necessitated extensive alterations in buildings.

Plykrome pipe will be satisfactory for this service because it possesses a low coefficient of friction and, at the same time, is not subject to corrosion; hence there will be no accumulation of scale, rust, or dirt which would tend to increase friction through years of operation. One-quarter inch thick Plykrome was used, the pipes being fabricated by the arc welding process into lengths of approximately 54 feet.



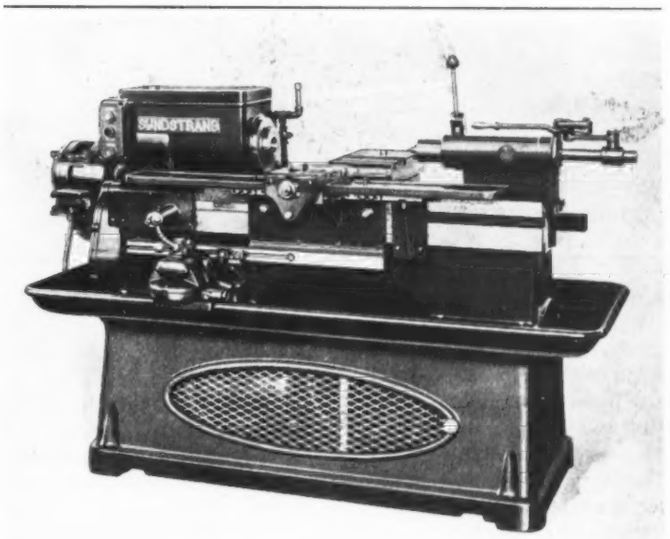
A Nickel-molybdenum Steel Crankshaft Made by the Midvale Co. for the E. I. du Pont de Nemours Co. The Over-all Length is Approximately 19 Feet, while the Largest Body Diameter is 24 Inches. The Journals are 20 Inches in Diameter, and the Crankpins, which have a Throw of 10 Inches, are 16 Inches in Diameter

Bakelite as a Fireproof Material for Ship Construction

Every so often the hazards of fire aboard ships are brought dramatically before the public. It is of interest to note that Bakelite materials have for years been employed on ships as a fireproof material in the construction of passenger accommodations. Bakelite is especially suitable for this purpose because of its fire-resistant properties, light weight, decorative effect, durability, high tensile strength, and resistance to the effects of water, sun, and air. Furthermore, the material is unharmed by smoldering cigarettes or by alcohol, and hence lends itself well for use in furniture, especially for table and desk tops.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts and Material-Handling Appliances Recently Placed on the Market



Sundstrand Six-Inch Stub Lathes of Automatic and Semi-Automatic Types

Stub lathes that have a 6-inch rating but will swing work up to 7 1/2 inches in diameter over the front and rear tool-slide ways and up to 17 inches in diameter over the bed ways have been added to the line of the Sundstrand Machine Tool Co., 2530 Eleventh St., Rockford, Ill. The capacity between the spindle nose and the tail-center of these machines is 16 3/4 inches. These stub lathes are made in automatic and semi-automatic types. They possess the necessary rigidity, speeds, and power for the efficient use of tungsten-carbide tools or tools made of other modern cutting materials.

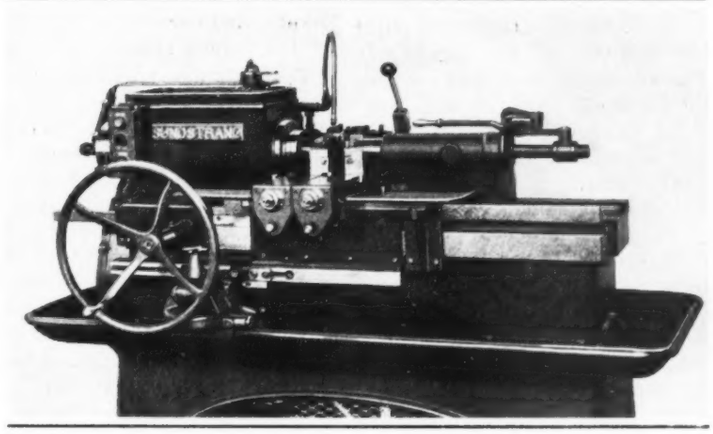


Fig. 1. Sundstrand Six-inch Stub Lathe of the Semi-automatic Type Equipped with Four Tool-slides

The standard automatic 6-inch stub lathe is shown in the heading illustration, while Fig. 1 shows a semi-automatic machine equipped with two tool-slides on both the front and rear carriages for turning and facing bevel-gear blanks. Fig. 2 shows a special arrangement in which four angular slides are provided for forming steering-worm blanks. The operating cycle of the automatic type is started by moving a lever at the front of the machine. The cycle consists of a rapid approach of the tools to the work; starting and stopping of the spindle, feed, and coolant pump; and starting and stopping of the rapid return movement of the tools.

The operating cycle of the semi-automatic machine is started by rotating a large handwheel, which effects the rapid approach of the tools to the work. The spindle, feed, and coolant pump then start and stop automatically. The cycle is concluded by again revolving the

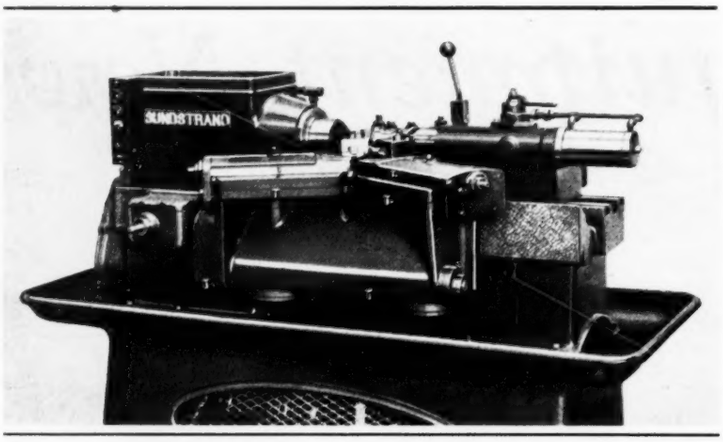


Fig. 2. Four Angular Slides on this Six-inch Stub Lathe Form Steering-worm Blanks

large handwheel, which rapidly withdraws the tools from the work.

These machines are made in three models, with three different types of drive. On the Model A machine, there is a chain drive from the motor to the speed-box and a gear drive to the spindle, spindle speeds ranging from 62 to 663 revolutions per minute being available. On the Model B machine, there is also a chain drive from the motor to the speed-box and a gear drive, including a non-metallic idler, to the spindle. The spindle speeds of this model range from 192 to 1790 revolutions per minute. The Model C machine has a flat-belt drive direct from the motor to the spindle, which provides spindle speeds from 1000 to 3500 revolutions per minute. The motor pulley of this model is made to fit a tapered bushing on the motor shaft, a construction which makes it possible to change pulleys within two or three minutes.

These stub lathes embody improvements in construction, as well as new features of design. One of the most important improvements is a large, extra strong spindle that is accurately machined to insure correct balance. An adjustable control stops the spindle before the completion of the rapid return. Other features include a ball-bearing live tail-center, a quick-acting tail-spindle clamp, a lever-operated quick-acting tailstock, and a large chip pan that confines the coolant and facilitates chip removal.

The motor for driving the spindle is accessibly mounted in a well ventilated compartment in the base. On the automatic machine, a separate motor actuates the rapid traverse movements. A new mechanism on the front of the machine insures accurate automatic engagement and disengagement of feeds on the semi-automatic machine and gives complete control of the operating cycle on the automatic machine. The set-up of the automatic machines is facilitated by a hand adjustment for the carriages. Pick-off gears for making feed and speed changes are fully enclosed and readily accessible.

The front carriage of these machines has an extreme travel of 16 3/4 inches. The front carriage feeds on the Models A and B machines are from 0.003 to 0.086 inch per spindle revolution, while on the Model C, they are from 0.0015 to 0.042 inch per spindle revolution. The rear toolslide feeds on the Models A and B machines are from 0.0012 to 0.034 inch per spindle revolution, and on the Model C, from 0.006 to 0.017 inch per spindle revolution. Motors of from 3 to 5 horsepower are recommended by the manufacturer for use with these machines. These machines have a net weight of 3600 pounds.

Norton Bortz (Diamond) Wheels

Wheels made up of crushed diamonds bonded together with Bakelite are made by the Norton Co., Worcester, Mass., for grinding and lapping cemented-carbide tools and for cutting up cemented-carbide shapes. The first of these bortz wheels produced by the company (bortz is the name applied to the grade of diamond used industrially) were only 1/4 by 1/4 by 1/8 inch and 3/8 by 1/4 by 1/8 inch in size. They were designed for the internal grinding of wire-drawing dies made of cemented carbide. The next development was a 4- by 1/4- by 1/2-inch wheel intended for producing sharp corners on carbide-tipped tools of special shapes, such as are used in automatic screw machines.

Cup-shaped wheels 3 inches in diameter, with a 3/8-inch rim, are now also being made for lapping small carbide-tipped tools and for grinding the clearance on reamers, surface broaches, and milling cutters tipped with cemented carbide. The cup-wheels can be supplied with diamond grains on the face only or on both the face and the rim. Thin cut-off wheels are made for cutting up cemented carbide shapes, and there is a 7- by 1/2- by 1 1/2-inch straight wheel.

These diamond wheels come in three different grain sizes which are easily identified by the color. The brown wheel is intended for grinding carbide-tipped tools when speed is most essential. This wheel is made up of No. 100 grain crushed diamonds. The green No. 200 grain diamond wheel is for lapping operations performed to produce keen cutting edges in the minimum time. The buff No. 320 grain wheel is intended for finish-lapping when true polished surfaces and microscopically keen cutting edges are necessary.

Bardons & Oliver No. 3 Turret Lathes

Universal and plain types of a new No. 3 turret lathe which have a 1 1/2-inch bar capacity and a 15 3/8-inch swing are being introduced by Bardons & Oliver, Cleveland, Ohio. These machines can be supplied with either a twelve-speed or an eight-speed all-geared head and with spindle speeds up to 1525 revolutions per minute. The drive is through a flange type motor that is attached directly to the head.

Other important features of these turret lathes include hardened steel ways for the bed, automatic ring type turret clamp, patented cantilever saddle construction, and flanged spindle end. Anti-friction bearings and helical high-speed gears are furnished for the head. All feed changes are made in the aprons. There is a centralized lubricating system, pumps being furnished on both the carriage and saddle aprons, if desired, to supply lubricant to the bed and slide ways by merely operating the pump levers. The drive to the coolant pump is equipped with a clutch for disengagement when not required.

In addition to the double multiple-disk clutch that is conventionally used for starting, stopping, and reversing, the head is provided with a second double multiple-disk clutch through which an instantaneous speed reduction of about 2 to 1 can be obtained for threading, reaming, and similar operations. Sliding gears furnish all other speed changes and make it possible to use a head of unusually compact design.

The sliding gears in the head are mounted on multiple-splined shafts. The flange type spindle end insures a rigid mounting for chucks or fixtures by reducing the overhang from the front spindle bearing to a minimum. All speed-change levers are located on top of the head within easy reach.

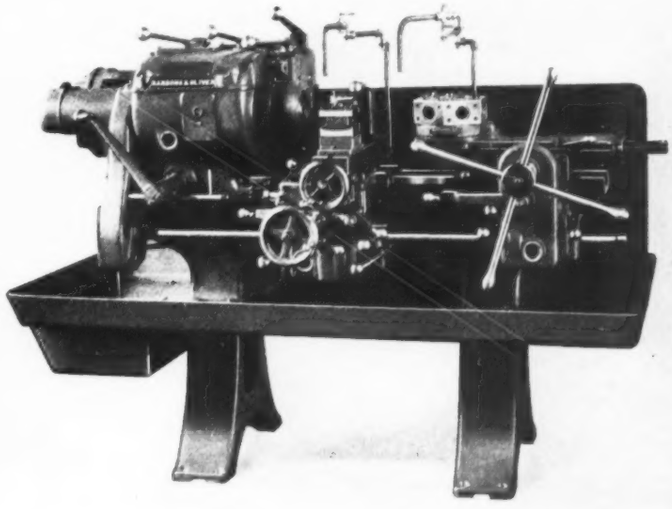
The flange type ball-bearing motor is bolted directly to the end of the head, and the rotor is pressed on the first drive shaft. The motor thus becomes an integral part of the machine, eliminating many parts, reducing weight, and improving the general appearance.

The universal carriage has both a power longitudinal feed and a power cross-feed, so that it is possible to do turning and boring as well as facing and forming with tools mounted on the cross-slide. Six reversible power feed changes to the carriage and cross-slide are obtainable independently of the turret feeds through the carriage apron. The feeds are engaged or disengaged by means of knock-out levers and cam-operated cone friction clutches. An indexing cylinder carrying six independent adjustable stop-screws automatically disengages the longitudinal feed of the carriage. The cross-feed is disengaged by an adjustable trip-dog on the cross-slide. The cross-feed screw is mounted in anti-friction bearings. A large micrometer dial equipped with observation clips facilitates the accurate gaging of diameters.

Automatic indexing of the square turret is effected by the same handle that clamps it to its seat. An open-side toolpost with serrated wedges of hardened steel that provide for height adjustment of the cutter is attached to the rear of the cross-slide.

The turret-slide and saddle have been entirely redesigned to increase their rigidity and to reduce fatigue of the operator. The patented cantilever construction of the saddle permits the cross-slide carriage to pass partly underneath it, thus giving the turret-slide a long bearing in the saddle and reducing overhang. The turret revolves on a tapered roller bearing and is automatically released, indexed, and clamped by the backward and forward movement of the turret-slide. The large-diameter automatic binder ring operates around the base of the turret and insures uniform turret clamping, the force of which may be regulated by means of an adjusting screw. Elimination of the binder handle relieves the operator of two hand movements each time that the turret is indexed.

Six visible independent stop-screws are carried in a cylinder which indexes automatically with the turret. These screws may be adjusted to disengage the power feed at any desired point for



Bardons & Oliver Turret Lathe, with Flange Type Motor Drive and Other New Features

each of the six turret faces. Six power feed changes to the hexagon turret are obtainable independently of the carriage through the saddle apron gearbox.

The automatic chuck and the bar feed are operated by a single lever located under the front of the head, without stopping the machine. The forward movement of this lever opens the collet and feeds out the bar, while the backward movement closes the collet. Improvements in the operating mechanism have increased the collet grip sufficiently to withstand the heaviest feeds of which the machine is capable. Elasticity in the operating mechanism compensates for slight variations in the work being gripped, while a stepped wedge takes care of larger variations.

Automatic Straight-Shank Nut-Tapping Machine

A standard straight-shank tap 15 inches long is employed in a precision nut-tapping machine being placed on the market by the Acme Pattern & Machine Co., Inc., 1559 Niagara St., Buffalo, N. Y. This machine is fully automatic, being equipped with a hopper feed of the rotary disk type, which is designed to prevent clogging. Hexagonal nuts from 3/8 inch, 24 threads per inch, up to 7/8 inch, 14 threads per inch, or hexagonal and square nuts from 3/8 inch, 16 threads per inch, up to 3/4 inch, 10 threads per inch, can be tapped.

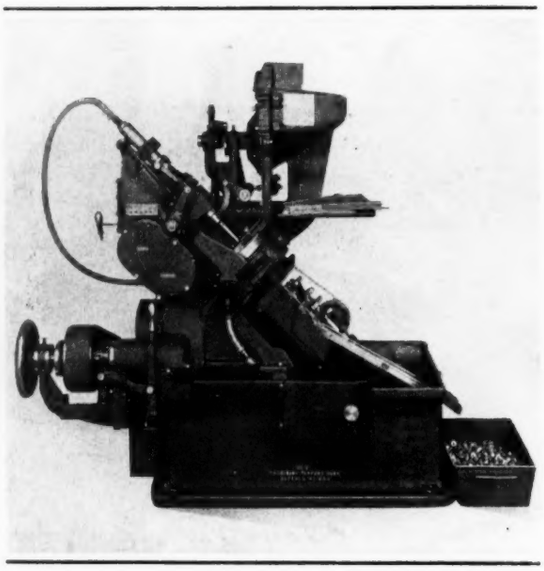
The tap used in this machine has flats milled on the shank to suit the holding jaws. The tap is placed in the spindle of the machine with a nut on the threaded portion, and a centering device is employed to hold the shank end until the jaws are tightened on the milled flats. Each jaw is actuated by four cams. The camshaft is driven through a friction device, which slips in the event that the work becomes jammed, thus actuating an electric switch that stops the machine.

In operation, the nut is advanced by a pusher which has the same lead as the tap. After the threading operation is completed, the nut drops out of the spindle to a stop. This stop releases the nut and permits it to come to rest on the first set of holding jaws when these jaws are closed on the tap shank. When the first set of jaws opens, the nut drops down on a second set, and when the second set opens, the nut is released from the tap and slides down a discharge chute.

Kearney & Trecker Cam-Milling Attachment

A cam-milling slide has been developed by the Kearney & Trecker Corporation, Milwaukee, Wis., for use with the Model K universal milling machines built by the concern. This attachment, as illustrated, consists of a special slide and base and a roller bracket. Power for driving the head is derived from the spiral change-gear unit mounted on the end of the table. Movement of the slide is obtained by the pressure of the roller as it follows the contour of a master cam. A weight which is attached to the slide holds the roller firmly against the face of the master cam.

The slide is so arranged that the dividing-head spindle can be set at right angles to the machine spindle for milling barrel cams, as shown in Fig. 1, or



Acme Pattern & Machine Co.'s Automatic Nut-tapping Machine of Straight-shank Tap Design

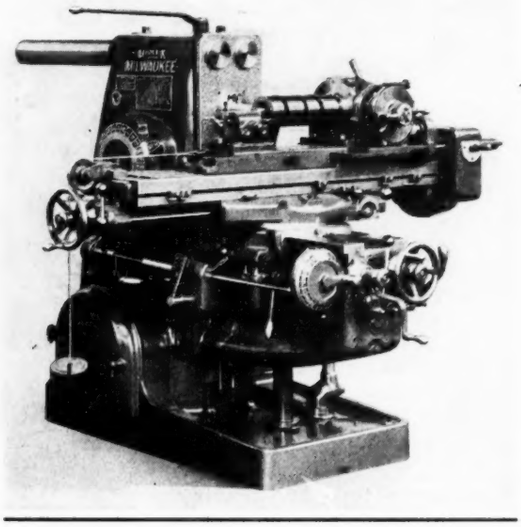


Fig 1. Milling Barrel Cams by the Use of the Kearney & Trecker Cam-milling Attachment

parallel with the machine spindle for milling face and peripheral cams as shown in Fig. 2. A right-angle drive bracket transmits the power from the spiral change-gear unit to the cam-milling attachment when it is set parallel with the machine spindle.

One of the features of this equipment is that in many cases a finished cam can be used as the master cam for cutting duplicates. Because of this feature, if ten cams of a certain kind are all that will ever be used, the cost of making a master cam can be saved by using the first cam as a master for cutting the nine additional cams. However, if duplicate cams are to be cut from time to time, it is advisable to make a master cam.

Cams up to 10 inches in diameter with 5 inches of travel can be accommodated by the attachment when it is used on a No. 2 machine. The maximum distance between centers is 12 inches. The complete attachment weighs 325 pounds.

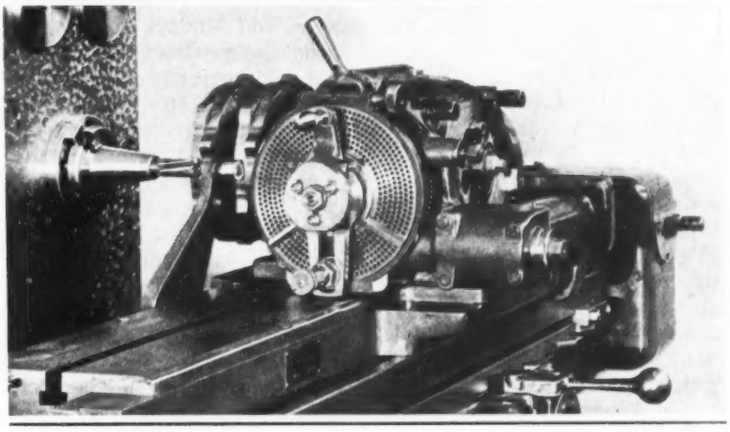


Fig. 2. Milling Peripheral Cams with the Spindle of the Cam-milling Attachment Parallel with the Machine Spindle

Diamond Knee-Action Surface Grinding Machine

A small surface grinding machine in which the table rests directly on a ground plane surface on the bed and is guided both longitudinally and laterally by a knee action is a recent development of the Diamond Machine Co., 9 Codding St., Providence, R. I. The intermediate table or moving spindle housing of conventional surface grinders is eliminated. The knee members which control the table of the new machine and the handwheel for feeding the table laterally are illustrated in Fig. 1, while the manner of moving the table by means of a long hand-lever is shown in Fig. 2. Unusual accuracy and finish of work are advantages claimed for the construction.

This machine is intended for use in production departments, tool and die shops, and toolrooms. It has a capacity for work up to 8 inches long by 4 inches wide, and the maximum vertical distance from the table to the bottom of a 7-inch wheel is 10 inches. There is only one oil film on this machine that is subject to the grinding pressure. The

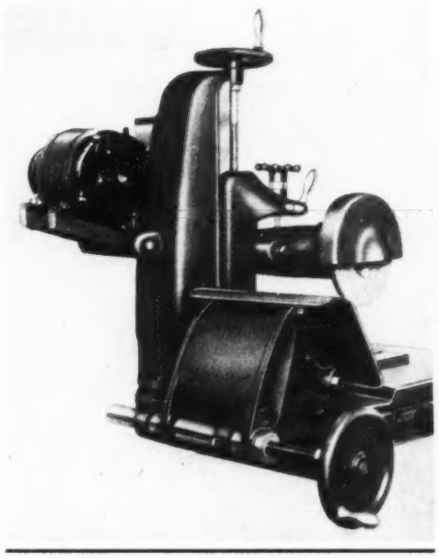


Fig. 1. Diamond Knee-action Surface Grinder

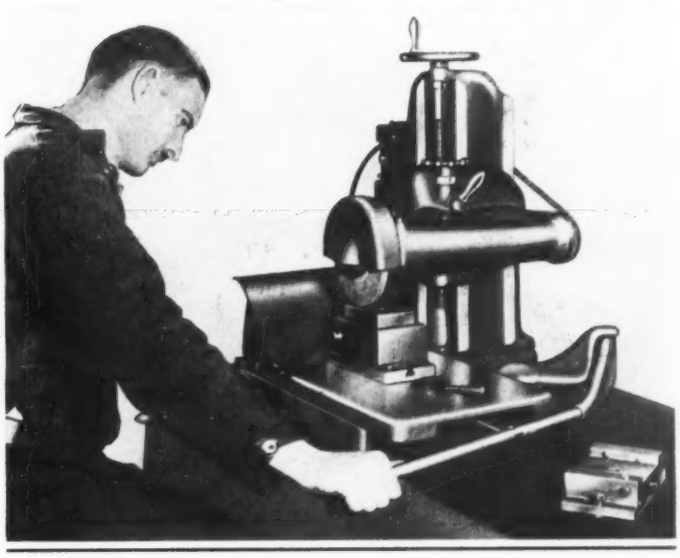


Fig. 2. Reciprocating the Table of the Knee-action Surface Grinder on the Plane Surface of the Bed

table way is covered by guards in all positions of the table. The upright is provided with three ways, as may be seen in Fig. 2, on which the saddle is moved vertically by means of a handwheel.

The saddle with its spindle housing is proportioned with adequate mass to absorb vibration and is supplied with a new clamping arrangement. After making a coarse adjustment of the wheel to the work, the saddle is clamped rigidly to the upright. A micrometer feed is then used for the final close adjustment. The saddle carries the spindle housing on hinged bearings.

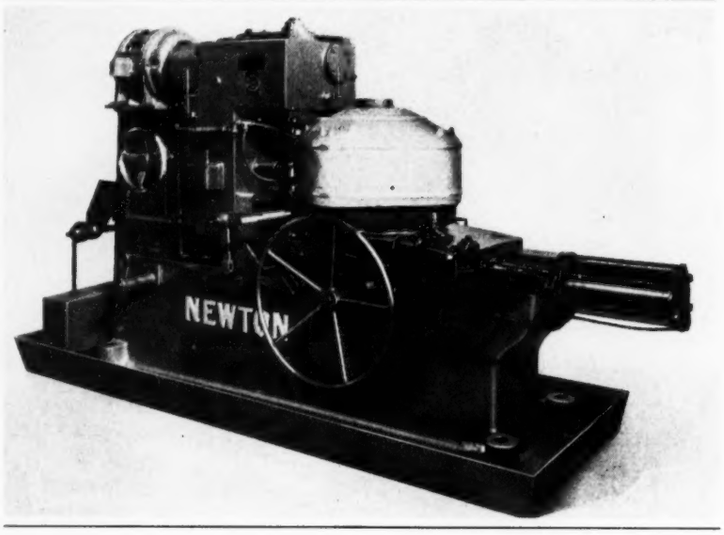
The spindle is equipped with a plain taper front bearing and with a rear radial and thrust ball bearing. A spring take-up eliminates radial and end play, thus automatically compensating for wear and always keeping the spindle in proper adjustment.

A 1/4-horsepower motor that operates on 110-volt 60-cycle single-phase current is regularly furnished, but 1/3- or 1/2-horsepower motors of any current characteristics can be furnished for greater stock removal than the standard model is intended for. The motor is mounted on rubber to avoid the transmission of vibration to the point of grinding. Power is transmitted to the spindle through a V-belt, an automatic belt-tightening device being provided in this drive. The machine can be furnished for operation on a bench or mounted on a floor column. Magnetic chucks or mechanical fixtures, as well as a diamond truing device, can also be supplied.

Newton Continuous Rotary Miller

A special type of vertical continuous rotary milling machine was recently built by the Consolidated Machine Tool Corporation of America, Rochester, N.Y., for the profile milling of surfaces around the outside of square or rectangular castings having rounded corners. This machine is equipped with two opposed vertical spindles. In the case of the job shown in the illustration, these spindles are fitted with concave cutters for profile-milling two continuous beads around the outside of aluminum washing-machine tubs. Both vertical spindles are mounted in Timken bearings. The upper spindle is adjustable by means of an eccentric sleeve to compensate for cutter grinding.

The rotary table is equipped with a special fixture for clamping and supporting the work. Both a circular feed and a reciprocating movement are provided for the rotary table. Reloading of the work is facilitated by quickly traversing the table to a limited position near the operator. As soon as a casting has been loaded and clamped, a release lever is operated to start the cycle, in which all four sides and four rounded corners of the two beads are milled at one revolution of the rotary table.



Newton Continuous Rotary Miller with Two Opposed Vertical Spindles

Conway Improved Compression Clutches

Two improved compression clutches with metallic asbestos lining have been added to the line of the Conway Clutch Co., 1543 Queen City Ave., Cincinnati, Ohio. In appearance, these Series 5 and 6 clutches are similar to the one illustrated and described in MACHINERY, April, 1928, page 639. However, the parts that draw in the ends of the band have a duplex action, while the lever remains relatively in the same position. The result is a clearance 68 per cent greater than was formerly thought necessary. Rubbing friction in the bearing is entirely eliminated.

The Series 5 clutch is made with a sleeve extension that permits its use in any desired type of drive, while the Series 6 clutch can be applied to a hub cast integral with a sprocket, drum, pulley, gear, or sheave. Both clutches are made in various sizes with a bore from 1 15/16 to 5 1/2 inches in diameter for transmitting from 25 to 50 horsepower at 100 revolutions per minute.

These improved clutches are intended specifically for use on material-handling equipment, such as hoists, winches, drums, and brakes. For slow-speed operation, the clutches can be supplied without the metallic asbestos lining.

Norton Six-Inch Type C Cylindrical Grinder

Six inches is the nominal swing of the latest addition to the line of Type C cylindrical grinding machines made by the Norton Co., Worcester, Mass. This machine is available in two lengths, which take work up to 18 and 30 inches long, respectively, between centers. Patterned after the 10- and 16-inch Type C machines brought out earlier this year, the new machine has a self-contained wheel unit and uses a standard 20-inch diameter wheel. The wheel-spindle, which is 50 per cent heavier than that on previous 6-inch machines, is end-driven by V-belts direct from a motor mounted on the machine, no idlers or intermediate shafts being required. The wheel-slide ways are force-feed lubricated and have a 20 per cent greater bearing area than earlier models.

The work carriage consists of a sliding table which travels on a vee and a flat way on the base. A swivel table is pivoted to it in the center. Both table ways are also force-feed lubricated. The headstock, footstock, steadyrest, center pointer, and radial truing device are clamped to the swivel table.

The headstock is driven by an adjustable-speed direct-current motor, either a rheostat or a drum controller providing a wide range of work speeds. The lever that operates the clutch and brake is now arranged vertically instead of horizontally, a feature that makes the operation of the machine easier.

The power-traverse machines are hydraulically actuated, the oil pump and its driving motor being an integral unit mounted within the base beneath a convenient cover plate. The reverse and throttle valves are of the same design as those used on the larger Type C machines. The table is traversed by a double-rod piston which operates in a cylinder attached to the base. Table speeds from 7 to 360 inches per minute are available. The table can also be moved by a handwheel which is automatically disconnected when the power traversing units are engaged. Quick-acting latches permit of disconnecting the piston altogether to afford a means of operating the table by hand, independently of the hydraulic system.

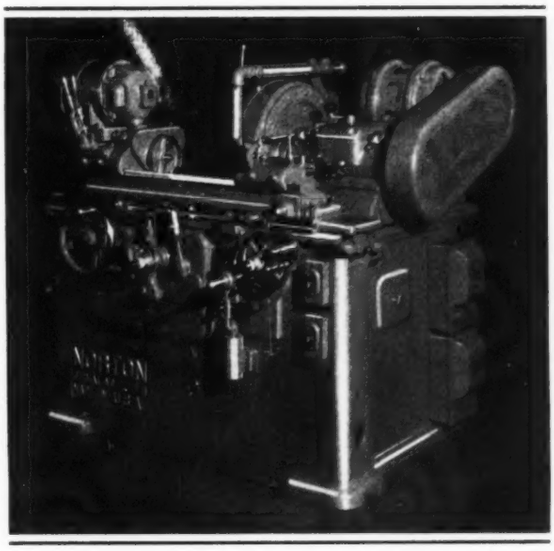
For plunge-cut operations only, a hand-traverse unit is substituted for the power-traverse elements. This unit provides a slow speed for wheel truing and a faster speed for moving the table into the grinding position, if necessary. The change from one speed to the other is quickly accomplished by means of a knob on the handwheel.

Both hand- and power-traverse machines can be equipped with a hydraulically operated wheel-head traverse unit. This unit moves the wheel-head rapidly in and out between grinds as much as 3 inches if required.

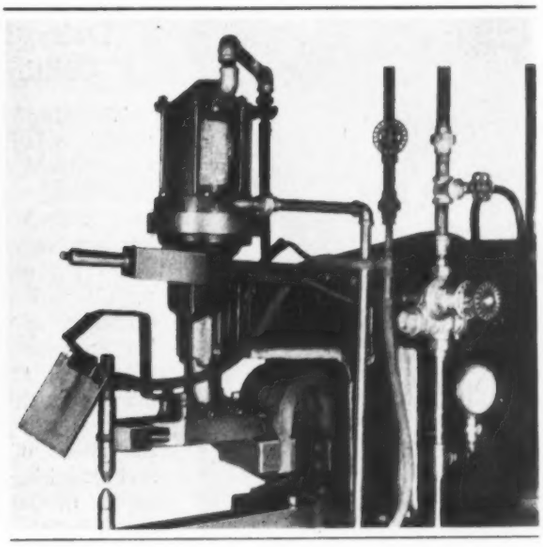
The 30-inch machine weighs approximately 4700 pounds.

Hanna Air or Hydraulic Cylinder for Welding Machines

A cylinder that may be either air or hydraulically actuated to close the electrodes of manually operated electric welding machines has been placed on the market by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. This cylinder is intended to be mounted, as illustrated, on the flange of the barrel surrounding the ram that closes the electrodes of welders.



Six-inch Machine Added to the Line of Norton Type C Grinders



Hanna Air or Hydraulic Cylinder Applied to a Welding Machine

Any desired pressure can be obtained on the electrodes by means of a regulating valve. The operation of the cylinder is controlled through a foot-operated valve.

In addition to relieving the operator of manual exertion in closing the electrodes, this cylinder insures correct and uniform pressure for making each weld. It is claimed that more welds can be produced per day as a result. These cylinders are made in 3-inch and larger sizes for application without requiring any machine work to be done on the welding machines.

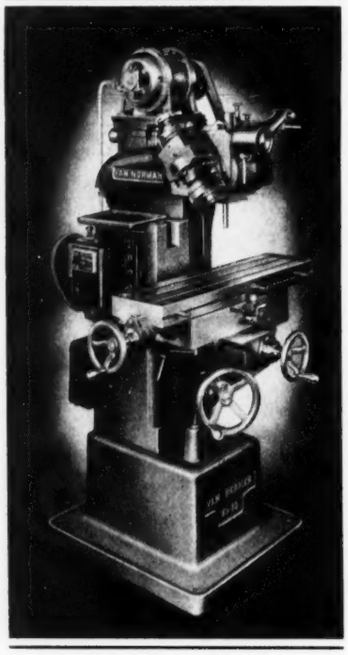
Van Norman No. 12 Miller

A No. 12 miller with features that particularly adapt it to the work of the tool-room and pattern shop is being introduced to the trade by the Van Norman Machine Tool Co., Springfield, Mass. This machine has the adjustable cutter-head and movable ram typical of all machines built by the concern. The cutter-head is adjustable not only for horizontal and vertical milling, but also for angular settings over a 90-degree range. With the sub-head attached to the face of the main head, almost any angular surface can be milled with a standard right-angle cutter for the full travel of the table.

The saddle and table of the machine are considerably heavier than on former Van Norman millers of corresponding range. The knee is of the box type, and other parts have been stiffened to make the machine more rigid than previously. Heavier work can be handled and at higher speeds.

All cutter-head drive gears are contained within the ram, the ram and the cutter-head making one complete unit which has no drive connection with the remainder of the machine. Antifriction bearings are used throughout. The standard cutter speeds range from 70 to 1465 revolutions per minute, but higher speeds can be provided if desired.

The motor mounted on top of the ram transmits power through a V-belt to the cutter-head drive gears. A separate motor at the back of the machine provides power for the table feed.



Van Norman Miller Designed for the Tool-room

Delta Slower-Speed Drilling Machines

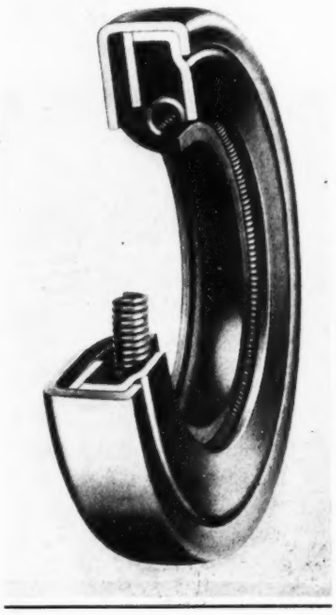
The standard line of drilling machines built by the Delta Mfg. Co., 3775 N. Holton St., Milwaukee, Wis., described in December, 1933, MACHINERY, page 254, has a wide range of speeds that adapt the machines for drilling metals and also for performing a number of operations on wood. To supplement these standard machines, the concern is now placing on the market a line having a slower speed range to suit the needs of general tool-room and machine shop work. The speeds of the new sensitive line are 390, 745, 1280, and 2050 revolutions per minute.

In appearance, the new machines are similar to the standard line. They are built in floor type, bench type, and double-spindle models, and may be equipped with either the "Delta-Grip" chuck, a 1/2-inch Jacobs chuck, or a No. 1 Morse taper spindle. Double-seal New Departure ball bearings are provided throughout. The spindle is of a free-floating design, and is equipped with a graduated quill having an adjustable depth pointer. There is a positive depth stop.

Models are also available with speeds up to 10,000 revolutions per minute for small-hole drilling. All machines can be equipped with precision tapping attachments.

Oil and Grease Seal for Shafts

An oil, grease, and fluid seal intended for application to all types of machinery embodying shafts is being placed on the market by the National Motor Bearing Co., 1200 Seventy-eighth Ave., Oakland, Calif. This seal is designed to completely exclude dust, dirt, etc., from bearings



Oil and Grease Seal for Rotating or Reciprocating Shafts

and to positively retain oil, grease, and fluids.

As may be seen from the illustration, the seal consists of an outer steel case which has a press fit that is accurate to within plus or minus 0.002 inch. An equalizing annular garter spring within the case provides a uniform continuous pressure against the sealing member at all points circumferentially.

The actual sealing member which contacts with the moving shaft can be made of various materials to suit different conditions of temperature, peripheral speed, unbalanced pressure, and chemical activity. A leather known as "Saetan" is generally used.

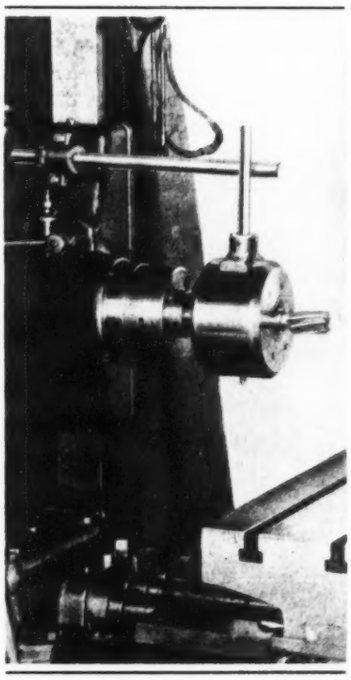
This seal is especially applicable to motors, hoists, pumps, engines, laundry machines, milk pumps, oil burners, agitators, and special machinery. It eliminates the need of stuffing boxes and other baffling means.

Ex-Cell-O High-Speed Milling Head

The Ex-Cell-O Aircraft & Tool Corporation, 1200 Oakman Blvd., Detroit, Mich., has brought out a high-speed head adapted for use on horizontal boring mills and milling machines. This unit is similar in appearance to the drill speeder described in February, 1934, MACHINERY, page 376. It provides the higher range of speed required in using the smaller sizes of end-mills and drills.

The driving shank of this head is furnished with a No. 5 Morse taper which makes it adaptable for use in all boring machine or milling machine spindles. The spindle of the head, in turn, is furnished with a No. 4 Morse taper to accommodate end-mills, drills, chucks, etc. The head has a 4 to 1 ratio over the spindle speed of the machine. It is designed for a top speed of 1500 revolutions per minute of the high-speed spindle. The maximum capacity of the unit is for 1-inch diameter end-mills and 1-inch drills, in steel.

The body of this milling head and the driving shank are of one-piece construction. The high-speed spindle is mounted in precision tapered roller bearings which take up end thrust in drilling, and both side and end thrust in milling. There is a boss on the outside of the housing that supports a bar engaging another bar mounted on the column of the machine, as shown in the illustration. Tools can be easily replaced in the milling head without its being necessary to remove it from the spindle of the machine.



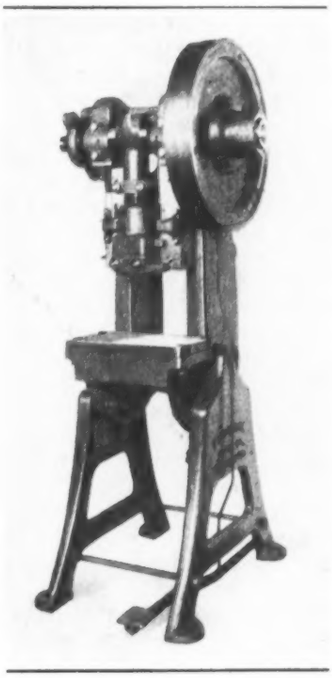
High-speed Head for Horizontal Boring Mills and Milling Machines

Federal Press with Roller-Bearing Flywheel

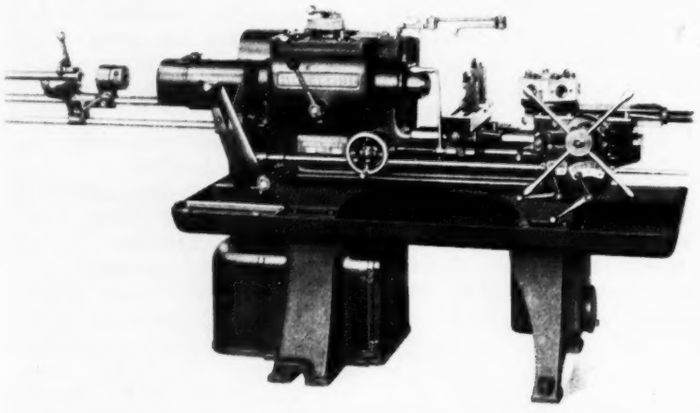
All the flywheel type presses of a new line of presses being placed on the market by the Federal Press Co., Elkhart, Ind., are equipped with Timken roller bearings in the flywheel. The same type of bearing is also supplied for the back-shaft of all the back-geared presses of this line.

The following advantages are claimed for the roller-bearing flywheel: The crankshaft does not become injured by the heavy wheel running on the top side of the crankshaft during the rest periods of the press; the bearing will last for practically the life of the press; it eliminates much clutch trouble ordinarily due to loose, wabbly flywheels; and replacement costs are reduced to the minimum in the event that it becomes necessary to replace the bearing. The flywheel stays up in position, allowing the clutch to function properly.

Other improvements on these presses include a clamping device on the pitman for holding the setting of the ram-adjusting screw, upper knock-out brackets which simplify adjustments, and a new method of locking the ball cap in place. The ball cap cannot be thrown off center. The locking device keeps the nut central, thereby preventing it from wearing out of round.



Federal Press with Flywheel Running on Timken Bearings



Warner & Swasey Turret Lathe Suited to the Use of Tungsten-carbide Tools

Warner & Swasey High-Speed Turret Lathe

Spindle speeds up to 1480 revolutions per minute are obtainable on a No. 2 turret lathe of 1-inch bar capacity that is being introduced on the market by the Warner & Swasey Co., Cleveland, Ohio. Another feature of this machine is an improved bar-feed mechanism. This turret lathe is equipped with a six-speed all-geared head which can be made to provide speed ranges of from 67 to 740 revolutions per minute up to from 134 to 1480 revolutions per minute. With a two-speed motor, twelve speeds ranging from 67 to 1480 revolutions can be supplied. The high speeds and ease of operation make this machine efficient for very small work, as well as for second-operation work in automatic bar departments.

The head has sufficient power to perform heavy-duty service with cemented tungsten-carbide tools. All gears in the head have ground teeth to insure silent operation. The forward and reverse multiple-disk clutch has ample area to permit reversing even at high speeds. It is possible to shift instantaneously from a turning speed to a threading or reaming speed, or vice versa, without stopping the spindle. Double-row precision Timken bearings are supplied at the front end of the spindle, and a preloaded straight roller bearing at the rear. All other shafts also run in roller bearings.

A new type of automatic circumference binder ring permits clamping and indexing of the hexagon turret by merely rotating the turnstile. This is an important factor with high-speed work, as reduced handling time is particularly desirable.

The new combination friction finger and ratchet bar feed has been designed for fast operation to match the high spindle speeds. Bars up to 5/8 inch in diameter are advanced by a friction finger so arranged as to prevent buckling or bending of the bar due to centrifugal force. Filler tubes insure balance at high speed by centering the bar in the spindle.

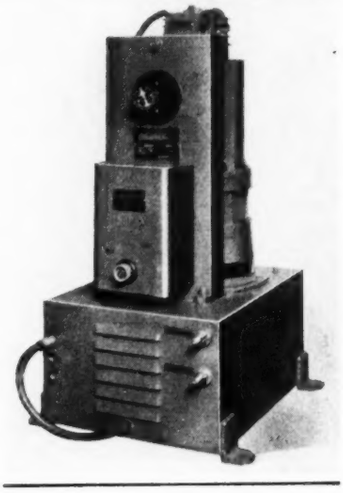
Bars above 5/8 inch in diameter are fully enclosed at the rear end. They are exposed only for the length of the ratchet feed stroke between the spindle end and the bar support tube. By using the ratchet feed for the larger bars, it is possible to have a maximum capacity of 1 inch with a spindle small enough in diameter to stand the high operating speeds of the machine.

The cross-slide can be arranged with a lever feed, a cross-feed, or a combination of the two. The power feed has been designed especially for continuous operation at high speeds. Six feeds ranging from 0.003 to 0.030 inch per spindle revolution are available for the hexagon turret. Two change-gears can be supplied to reduce these feeds one-half.

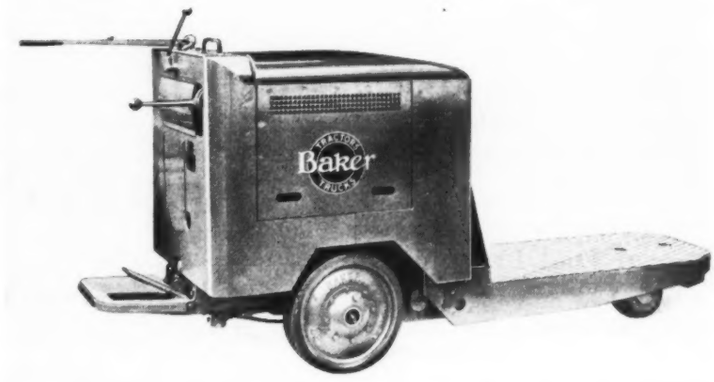
Lincoln 75-Ampere Arc Welder

An SA 75 arc welder intended for use on thin sheets, plates, and shapes in garages, metal-working shops, and industrial plants is the latest development of the Lincoln Electric Co., Cleveland, Ohio. This welder is a small motor-generator unit which can be used on any alternating-current power line, including 110-volt circuits. In addition to these features, the welder is moderately priced, so as to be within the reach of the average small shop.

This new welder, according to the manufacturer, is the first unit that will deliver as low a current as 20 amperes at the arc without the use of auxiliary devices. As a result, it opens up an entirely new field of application for arc welding. Automobile repair shops will find that the welder provides the low uniform welding current needed for fender and body repairs. At the same time, it can be used for repairing bumpers, frames, water jackets, cylinder heads, and other heavier parts. Damaged cylinder heads



Arc Welder Designed Particularly for the Small Shop



Three-ton Truck of Streamline Design Made by the Baker-Raulang Co.

can be repaired without removing the engine from the car, since preheating is not required.

Electrodes as small as 1/16 inch can be used, which makes the welder applicable to materials as light as No. 24 gage. It is said that welds can be made on light materials with the uniform quality regularly obtained on heavier materials by employing the shielded-arc process of welding.

The welder employs a 25-volt arc with a current range of from 20 to 100 amperes. The generator is of 75-ampere rating. The equipment is 20 inches long, 16 inches wide, and 40 inches high. It can be provided with small wheels to facilitate moving.

Baker Three-Ton Elevating Truck

The Baker Industrial Truck Division of the Baker-Raulang Co., Cleveland, Ohio, has brought out a three-ton elevating truck with several new features. The most obvious change from previous models is a streamline enclosure for the battery box and controls, which improves the appearance of the truck and increases the safety of the operator. There are no protruding units or parts against which the operator can be thrown in the event that the truck hits some obstruction. The truck is provided with a two-wheel drive and a four-wheel steering arrangement.

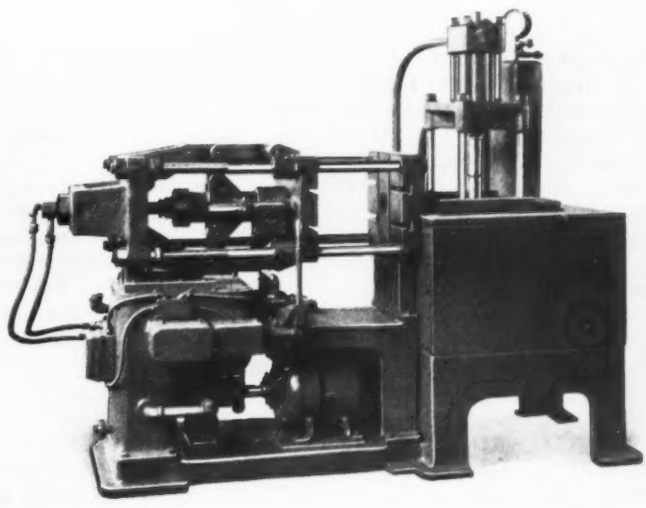
Other new features include an electrically welded frame, an alloy steel trailing axle, a larger-travel brake than on previous models, roller bearings at the top and bottom of the steering mast, needle bearings in many of the steering-rod connections, somewhat higher traveling speeds, and a sponge-rubber pad on the operator's platform.

All sliding contacts between the drive axle and the chassis are eliminated by the use of a patented arrangement in which the axle is suspended by torque and drive yokes which permit free motion of the axle over uneven floors without transmitting jars or shocks to the truck frame. The helical springs formerly used have been replaced by rubber piles which have the same shock-absorbing ability and will not break.

Standard platforms for this truck are furnished in lengths from 55 to 84 inches. The standard platform height above the floor is 11 inches, and the lift is 5 3/8 inches. The standard platform width is 26 1/2 inches.

Lester Fully Hydraulic Die-Casting Machine

In a high-speed die-casting machine recently developed by the Lester Engineering Co., 278 Rockefeller Bldg., Cleveland, Ohio, hydraulic power is employed not only for opening and closing the die but also for injecting the molten metal into the die. This equipment is entirely self-contained and is controlled



Lester Die-casting Machine which Utilizes Hydraulic Power for Injecting Molten Metal into the Die and for Operating the Die

through a single lever. Productive speeds up to 600 operations an hour are possible, because of the fast moving hydraulic toggle mechanism which actuates the dies. This device is positive-acting and develops a safe locking pressure of 35 tons.

In conjunction with the die-operating mechanism is an automatic plunger control that eliminates lost time between the various phases of the operating cycle. High quality of the finished parts with respect to solidity and surface finish is claimed for the solid displacement method of injecting the metal into the die. The automatic plunger control leads to uniformity of results by eliminating the human element, and therefore minimizes scrap. Accessibility is another feature of the machine, it being possible to change dies within a few minutes.

In the operation of this machine, a forward movement of the lever at the front closes the die hydraulically. As soon as the die is completely closed and locked, the plunger forces the metal into the die. The plunger remains down and continues to exert pressure on the metal as long as may be required for the particular part being cast. An adjustment makes it possible to vary this period accurately. The plunger then returns to its original position. By pushing the operating lever back, the die is again opened.

Important specifications are as follows: Die opening, 5 inches; maximum die height, 12 inches; minimum die height, 4 inches; metal pot capacity with zinc, 300 pounds; and plunger capacity with zinc, 5 pounds.

Starrett Dial Indicators

A complete line of dial indicators has been added to the line of precision instruments, tools, and tapes manufactured by the L. S. Starrett Co., Athol, Mass. To make these indicators completely rustproof, the gears, rack, dowels, screws, stem, bushings, etc., are made of stainless steel, while the case and bezel are chromium-plated.

The back is a solid die-casting, recessed to hold a lug that permits the indicator to be clamped to tool-spindles, machines, jigs, or fixtures. The lug can be attached on or off center, and it can be turned parallel or at right angles to the direction of the spindle. The case is a die-casting with the stem cast integral.

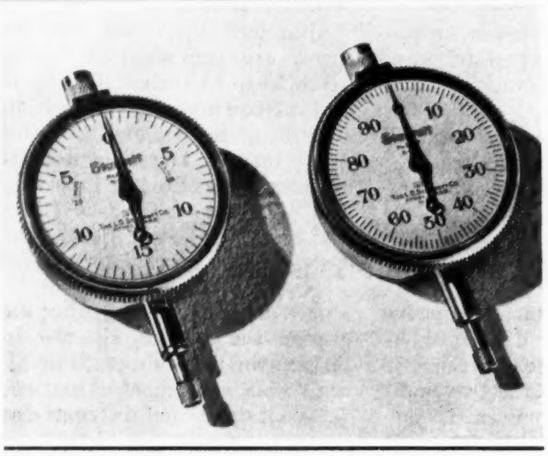
Genuine sapphire jewels give the gage mechanism a smooth watch-like movement. All gears and pinions are finished to unusual accuracy. The dials have an easily cleaned enamel surface, and the crystal is non-breakable.

Among the indicators available are models reading to 0.001 inch, 0.0005 inch, 0.0001 inch and to hundredths and five-hundredths of a millimeter. There are models that show both plus and minus measurements. On all indicators the dial can be turned to bring the zero mark to any point in relation to the hand and be locked in place.

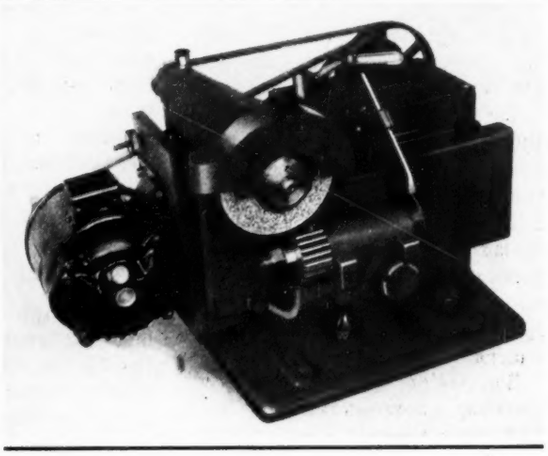
Machine for Sharpening Small Saws in Gangs

Milling, slitting, and screw-slotting saws can be sharpened in gangs on the fully automatic machine here illustrated, which has recently been developed by the Wardwell Mfg. Co., 3167 Fulton Road, Cleveland, Ohio. The gang of saws is lined up on the arbor and ground completely at one setting. The machine indexes the saws automatically, one row of teeth at a time. The grinding is done by a wheel that is shaped to sharpen the tooth points and "gum" the throats in one operation. A gang of saws is sharpened within a variation of plus or minus 0.001 inch of the desired diameter.

The saw arbor is fitted to a horizontal slide that is reciprocated under the grinding wheel by an eccentric which has a stroke adjustable up to 3 inches. There is a clutch on the eccentric



Dial Indicators with Stainless-steel Working Parts



Automatic Sharpener for Small Metal Saws

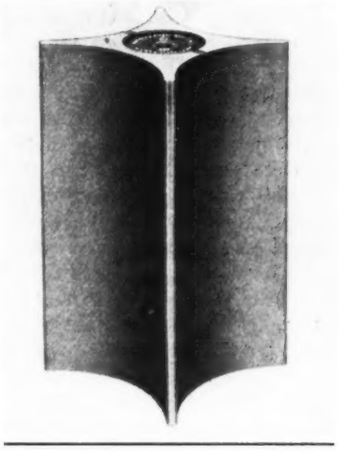
shaft which can be instantly thrown into or out of engagement. Thus the slide movement can be stopped for making preliminary adjustments. The dovetail slides are protected from dirt and gibbed to take up wear. The saw arbor can be adjusted vertically and horizontally.

A stop or gage facilitates lining up the saw teeth when the saws are being placed in position for grinding. This stop is swung downward out of the way after the saws are locked on the arbor. The saws are indexed at a speed of 28 teeth a minute. A diamond dresser can be furnished for attachment to the wheel guard.

Saws from 2 to 5 1/2 inches in diameter and with a tooth spacing up to 3/8 inch from point to point can be sharpened. The saw arbor has a capacity for holding gangs of saws up to 1 3/4 inches in total thickness.

Brown & Sharpe Surface-Plate Square

A square intended for use on surface plates has been placed on the market by the Brown & Sharpe Mfg. Co., Providence, R. I., under the designation No. 559. Both ends of this precision tool are at right angles with the sides. As the square is of one-piece construction, it is not subject to changes from handling and from small variations in temperature. The weight and shape of the square are such that it is not easily upset. It is made of hardened steel, and is 4 inches high by approximately 3 inches between opposite edges.



Brown & Sharpe Square for Use on Surface Plates

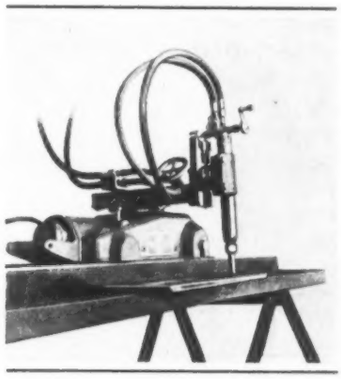
Handy Vise for Drilling Machines

Built-in parallels are a feature of a handy vise for application to drilling machines which is being placed on the market by the National Machine Tool Co., Racine, Wis. Work held horizontally on these parallels is always level and cannot slip. There is a clearance of 2 inches from the bottom edge of the parallels to the top of the adjusting screw.

Drilling Machine Vise with Built-in Parallels

A V-groove on the stationary jaw of the vise facilitates the holding of round stock either horizontally or vertically. The vise can be seated on any of three sides. It is designed to eliminate interference from chips or burrs.

This vise is available in three models. Model 1 has a maximum jaw opening of 3 inches, and is equipped with jaws 3/4 inch deep by 2 1/2 inches wide; it weighs 10 pounds. Model 2 has a maximum jaw opening of 10 inches, and is provided with jaws 2 inches deep by 6 inches wide; the net weight is 20 pounds. Model 3 also has a maximum jaw opening of 10 inches, but its jaws are 3 inches deep by 8 inches wide, and the net weight is 34 pounds.



Oxweld Monitor Oxy-acetylene Cutting Machine

Oxweld Monitor Cutting Machine

The Linde Air Products Co., 30 E. 42nd St., New York City, has added an "Oxweld Monitor" to its line of oxy-acetylene cutting machines. This equipment is of an unusually rugged construction and is streamlined to facilitate both operation and maintenance. It can be easily moved about, and is adjustable through the entire range of oxy-acetylene cutting.

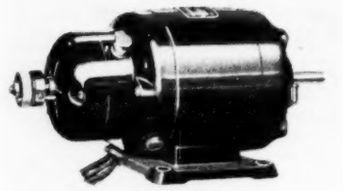
This machine can be used for automatic straight-line cutting of practically unlimited length, straight bevel cutting (two bevels at a time if desired), preparing plate edges for welding, cutting circles or rings up to 100 inches in diameter, and cutting curved or irregular shapes. Provision is made for using two blow-pipes simultaneously, if desired. They can be mounted either on the same or on opposite sides of the machine and adjusted independently. The slide for the blow-pipe holders can be swung instantly into any horizontal position over a working arc of 250 degrees.

Sensitive indicators eliminate all guesswork in speed control. By merely setting the indicator and shifting a lever, any speed can be obtained within the range of 2 to 48 inches a minute. The speed regulator is located near the guiding handle of the machine, so that it is possible to alter the speed without stopping the operation.

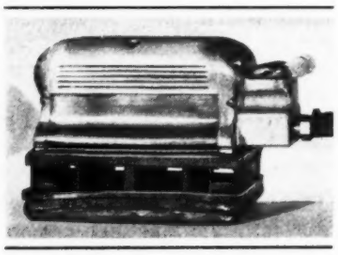
Bodine Larger Governor-Controlled Motors

Electric governor-controlled motors in ratings ranging from 1/10 to 1/4 horsepower have been added to the line of the Bodine Electric Co., 2264 W. Ohio St., Chicago, Ill. Heretofore, all governor-controlled motors made by the concern were smaller than 1/10 horsepower. The new line is available in series and compensated-series types with an approximate speed range of from 500 to 7500 revolutions per minute. The motors are also available with built-in worm-gear speed reducers of various ratios, the highest of which is 60 to 1.

The accuracy of speed control on these motors is said to closely approach the performance of synchronous motors. Two forms of electric governors are available, one of which can be adjusted while the motor is running, while the other can be adjusted only when the motor is at a standstill.



Bodine Governor-controlled Motor Made in Larger Sizes



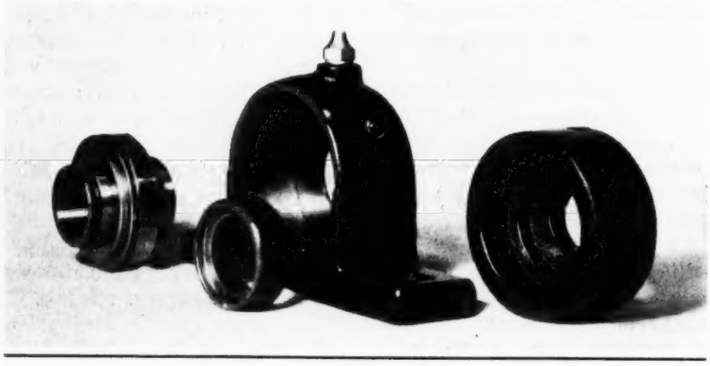
Air-driven Sander that Makes 3000 Strokes a Minute

Fafnir Cork-Insulated Ball-Bearing Pillow Block

Silent operation is insured in a ball-bearing pillow block that is being placed on the market by the Fafnir Bearing Co., New Britain, Conn., through the provision of a cork insulating pad. This pad fits into the housing and around the bearing itself. It is treated to prevent separation of the cork particles. The pad also serves as a seal against the escape of lubricant and the entrance of dirt.

The ball bearing is of the wide inner-ring type and has the Fafnir self-locking collar. It is of a deep-groove large-ball design that affords a high load capacity with respect both to end and radial thrust. The housing is an iron casting with a ribbed base.

The pillow block is prelubricated at the time of assembly, so that it does not require attention for at least a year. The lubricant can be renewed by means of grease tubes, the proper fitting being supplied in the housing.



Fafnir Ball-bearing Pillow Block with a Cork Pad that Insures Silent Operation

Speed-Bloc Air-Driven Reciprocating Sander

An air-driven device for sanding and polishing metal, wood, or stone sufaces is being introduced to the trade by the Sterling Products Co., 314 Curtis Bldg., Detroit, Mich., and 129 W. Third St., Los Angeles, Calif. This device weighs 7 pounds and operates on compressed air of 70 pounds per square inch or more. The sanding motion is an oscillating or reciprocating one. The stroke of the abrasive pad is 1 1/4 inches, and between 2500 and 3000 strokes are made per minute. The pad moves back and forth with the same motion as is used in hand sanding, and does not leave a grained surface on the work.

The pad that carries the abrasive paper is made of rubber and felt. It is bridged in such a manner as to be fully flexible; hence it is applicable both to convex and concave surfaces. The sander is 7 3/4 inches long, 4 3/4 inches high, and 3 3/4 inches wide. It can be used for long periods of time without tiring the operator and reduces the sanding time. It can be employed for either wet or dry sanding.

Portable Grinder with Built-in Air Filter

All the air that enters the motor of a portable electric grinder being introduced on the market by the Chicago Wheel & Mfg. Co., 1101 W. Monroe St., Chicago, Ill., is cleaned by a built-in filter. The important advantage of this filter is that it eliminates the abrasive dust that sometimes enters the bearings of such tools, causing undue wear, or that lodges on the commutator field leads and brush-holders, resulting in short circuits and eventual burning out of the armature.

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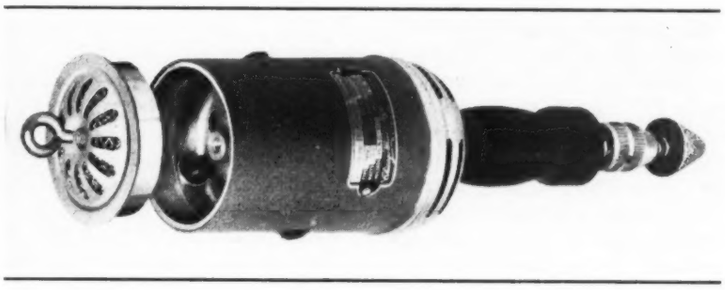


"Hi-Power" Portable Electric Grinder with Filter that Cleans All Air that Enters the Motor

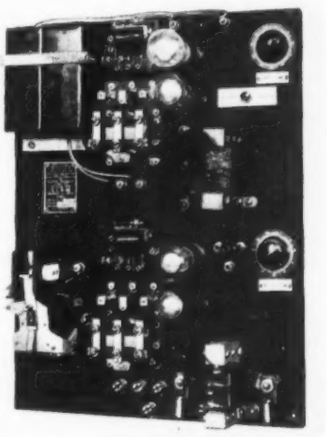
the air cleaners used on automobile carburetors. It can be easily removed for periodic cleaning and oiling. Ventilation is not impaired, even when the filter becomes loaded with foreign matter.

The grinder weighs 4 pounds, runs at 17,000 revolutions per minute, and drives a 2-inch diameter grinding wheel. The motor housing is an aluminum casting that extends out over the motor shaft and air filter. An insulated cushion grip affords a positive control and operating flexibility. The grinder can be used at any angle.

EC&M Automatic Repeat Weld Timer

An automatic repeat weld timer intended for use in connection with resistance welding machines having air- or motor-operated electrodes is being placed on the market by the Electric Controller & Mfg. Co., 2700 E. 79th St., Cleveland, Ohio. This repeat timer is similar to the standard automatic weld timer made by the concern, except that it has an additional timing circuit for governing the length of time that the electrodes are separated to allow the work to be moved into the position where the next weld is to be made.

The welding period provided by this timer varies in inverse proportion to the rate of current flow, and thus insures that the correct number of heat units are put into each weld. The length of the welding time and of the "off time" can be changed by merely making adjustments of two electrical circuits. This means that the timer can be set to suit a "green" operator, and as he becomes more expert, the off time can be gradually shortened.



Automatic Repeat Weld Timer with Easy Adjustment Feature

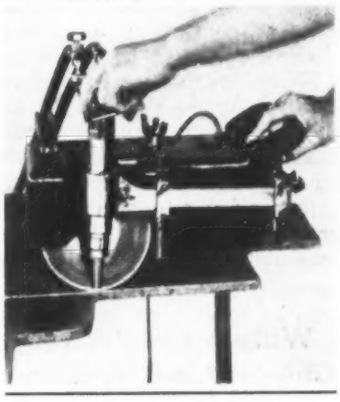
The illustration shows an automatic repeat weld timer that has been removed from its dust-tight cabinet. On the right-hand side of the panel are the dials for adjusting the off time and the welding time. Below the upper dial that governs the off-time period is a small double-throw snap switch which permits the timer to be set for automatic repeat operation or to provide single-shot operations, as may be required in making trial welds or in other cases when it is desired to make one weld at a time.

Airco-DB Tractograph

The latest addition to the line of oxy-acetylene cutting machines manufactured by the Air Reduction Sales Co., Lincoln Bldg., 60 E. 42nd St., New York City, is the Tractograph here illustrated. This machine provides a simple means of accurately cutting steel plates and slabs into shapes of straight, circular, or irregular outline extending over practically unlimited areas. Material up to 2 inches in thickness can be cut.

This equipment is a small compact motor-propelled unit which can be quickly adjusted to travel at various speeds from 2 1/2 inches a minute up. As the unit travels, it is guided by hand along the contour that has previously been laid out and scribed directly on the plate or slab being cut. The operator can change the direction of the machine easily, making it possible to turn sharp corners.

Beveled as well as perpendicular edges can be cut. With the radius rod in place, arcs or complete circles can be cut automatically, and without the radius rod smaller circles or arcs can be cut by guiding the device manually. The Tractograph is capable of traveling up an incline of approximately 10 degrees on ordinary hot-rolled steel plate without slipping. The device can be carried about and used wherever 110-volt alternating or direct current is available.



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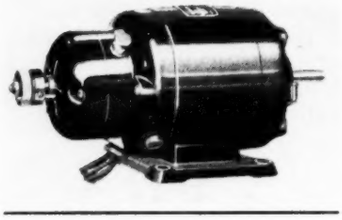

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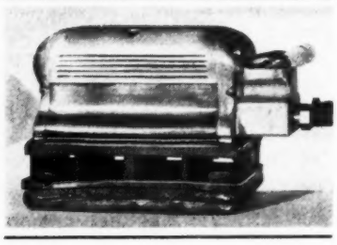

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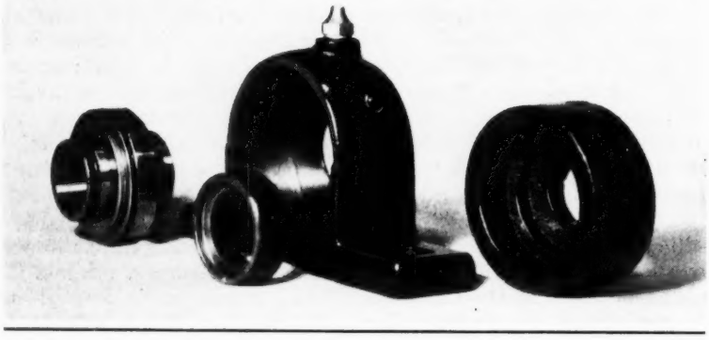

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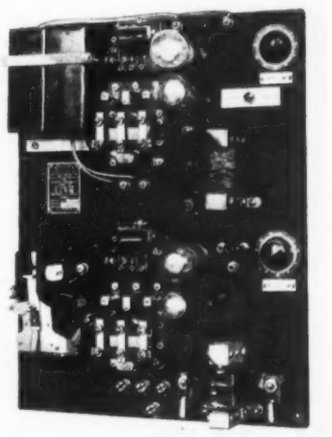

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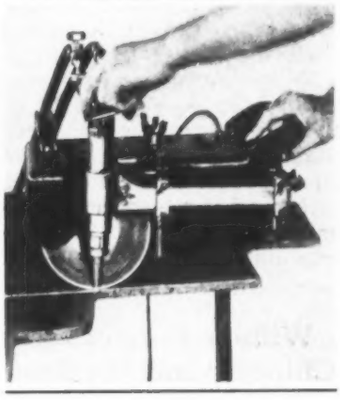
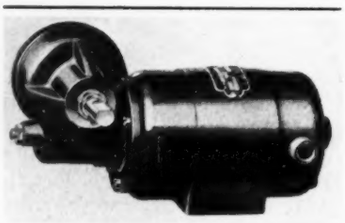


Airco-DB Oxy-acetylene Cutting Machine



Dumore Motor with Single-gear Reduction

Dumore Motor with Built-In Speed Reducer

A 1/7-horsepower motor with a single-gear reduction unit that is capable of carrying the full power of the motor has been added to the line of products of the Dumore Co., 25 Sixteenth St., Racine, Wis. This motor is of the universal type, operating on either direct or alternating current. Three gear ratios can be supplied from stock, 5 to 1, 14 1/2 to 1, and 34 to 1, giving shaft speeds of 1300, 448, and 191 revolutions per minute, respectively.

The gear housing is an integral part of the motor frame. The standard mounting is shown in the illustration, but when required, the gear unit can be positioned on the motor case so that the gear shaft projects at any desired angle in relation to the base (but always at right angles to the armature shaft).

The gear unit is equipped with a ball bearing to take the thrust of the worm. Another ball-thrust bearing can be supplied at the opposite end to take the thrust obtained with the reverse rotation. A forced-air ventilating system makes the motor suitable for continuous duty. The complete unit weighs 7 1/2 pounds.

Willson Goggles for Chippers and Welders

Protection from injuries to the eyes in both chipping and welding operations is afforded by a single pair of goggles recently devised by Willson Products, Inc., Reading, Pa. These goggles (Style DC50) are equipped with two pairs of lenses. An unusually tough pair protects the operator from flying chips, impacts, etc., while an additional pair of lenses in a hinged frame affords protection from dangerous light rays and glare. In chipping or grinding operations, the hinged lenses are raised, as shown in the illustration, and when welding is to be performed they are merely swung downward over the other lenses.

The double protection feature of the new goggles makes it unnecessary for a workman to put on different goggles when he changes from grinding or chipping to welding, and vice versa. The goggles can be worn comfortably over spectacles. Ventilation is provided through indirect ports.

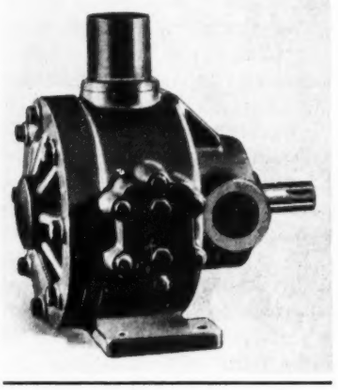
Willson Goggles with Two Pairs of Lenses that Provide Protection in Both Chipping and Welding Operations

Racine Variable-Volume Hydraulic Pump

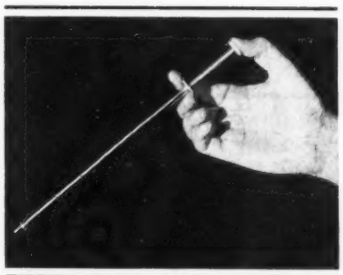
A constant pressure of 500 pounds per square inch and momentary pressures up to 1000 pounds per square inch can be obtained with a pump which is being introduced on the market in three sizes by the Racine Tool & Machine Co., Racine, Wis. The volume ranges from 0 to 2000, 4000, and 6000 cubic inches per minute. The three sizes are furnished in one case, the variations in capacity being obtained by providing pumping rotors of different widths. The pumps are suitable for installation on machines as built-in units.

These pumps operate at 15,600 impulses a minute when driven at a speed of 1200 R.P.M. This insures smooth operation at all pressures. The volume delivered by the pumps is controlled from zero to maximum by offsetting the governor ring or pumping chamber either mechanically or automatically. An automatic control is provided by a piston type of hydraulic governor that operates the pump at full volume until the predetermined pressure is reached. The governor then reduces the pumping chamber so that just sufficient oil is pumped to maintain the desired line pressure. This feature eliminates all by-passing of surplus oil, with a consequent reduction in the temperature rise of the oil, and also reduces the horsepower input and the amount of oil required in the system.

The automatic control is particularly advantageous on presses, grinding machines, die-casting machines, planers, etc., and in the operation of chucks, lifts, stokers, broaches, and other devices.



Racine Variable-volume Hydraulic Pump



Tool for Handling Screws and Other Small Pieces

Bonney Holding Tool

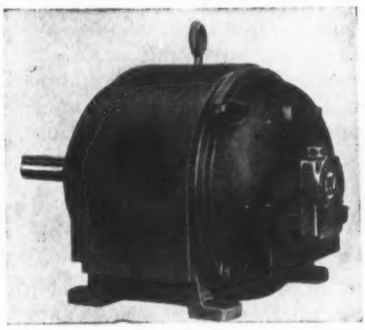
A handy tool that facilitates the holding, gripping, inserting, removing, and picking up of such objects as screws, washers, nuts, bolts, taper pins, and valve pins has been placed on the market by the Bonney Forge & Tool Works, Allentown, Pa. This tool is particularly convenient for automotive mechanics, electricians, radio service men, and the assemblers of typewriters and business machines.

The tool has four fingers attached to a tube which operates inside a second tube. The four fingers are opened to grasp the object when pressure is placed on a plunger. Upon release of the pressure a spring closes the fingers tightly around the object so that it can be screwed or lifted. This holding tool is made in three sizes with ranges of 4, 6, and 8 inches.

Westinghouse Splash- and Weather-Proof Motor

A new splash-, drip- and weather-proof motor intended for use indoors or outdoors where dripping or splashing liquids are encountered has been brought out by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The frame and end brackets of this motor are made of solid castings. There are no exposed sheet-metal parts that can be attacked by corrosion. The motor is highly resistant to the gases encountered around a refinery or to the chemicals that are met with in paper mills, chemical plants, etc.

A baffle plate that is cast integral with the inner side of the motor bracket prevents splashing liquids from reaching the motor windings. The motor is available with either ball bearings or sealed sleeve bearings. It is obtainable in both squirrel-cage and wound-rotor types.



Westinghouse Motor Designed to Withstand Moisture

MACHINERY'S New HANDBOOK

MACHINERY'S HANDBOOK (Ninth Edition). Erik Oberg and Franklin D. Jones, Editors. 1592 pages, 4 1/2 by 7 inches. Published by THE INDUSTRIAL PRESS, 148 Lafayette St., New York City. Price, $6.

MACHINERY'S HANDBOOK contains the mathematical tables, rules, formulas, general data, and established standards used in shops and plants where all classes of machines or other mechanical devices are designed and manufactured.

The Ninth Edition has just been published in order to include new or revised standards of particular importance in machine design and construction, and miscellaneous mechanical data representing recent developments in engineering and manufacturing practice. This is in line with the publisher's policy of revising MACHINERY'S HANDBOOK as frequently as is required to include important new or revised standards, as well as other matter known to be used throughout the mechanical field.

Since 1930, there have been 367 additions and revisions, large and small, and the Ninth Edition alone contains 172 revisions and improvements ranging from complete new sections to small but very important changes for all engineers, machine shop executives, and mechanics.

Owners of the Eighth Edition will be particularly interested in changes in the Ninth. The major revisions of the Ninth Edition include new strength of materials data; load capacities of ball and roller bearings; recent developments in plain bearing design; new tables and information on designing different classes of gearing, including spiral bevel and hypoid gears; enlargement of small pinions to avoid undercut teeth; revised SAE standards; socket-type set-screws and cap-screws; additional screw-thread data; standard milling cutters; new section on roller chain transmission covering American standard chain sprockets and cutters; revised speed and feed data including data from actual practice on cemented-carbide tools; new standards for taps, gages, and milling cutters; hardness conversion table; electric motor characteristics of value to machine designers; die-casting compositions; weight tables for brass, aluminum and copper; and, in addition, a great many smaller sections and revisions pertaining either to new or improved standards or to recent developments.

The HANDBOOK is divided into 126 main subjects, and any one of the many thousands of items in these main divisions can be located readily by referring to an exceptionally complete index containing whatever main or entry word the user is likely to think of. There is also a special "thumb index" for opening the book instantly to any one of the fourteen main sections most frequently consulted.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies can be Obtained by Writing Directly to the Manufacturer.

Welding Equipment

LINDE AIR PRODUCTS CO., 30 E. 42nd St., New York City. Booklet entitled "The Maintenance of Reciprocating Parts," dealing with the application by the oxy-acetylene process of wear-resisting bronze to the wearing surfaces of sliding parts. The booklet points out the advantages of bronze-surfacing as an efficient means of reclaiming pistons and similar parts, and gives numerous examples of the successful use of this process in different fields.

Oxy-Acetylene Welding and Cutting Equipment

AIR REDUCTION SALES CO., Lincoln Building, 60 E. 42nd St., New York City. Booklet describing the Airco-DB Tractograph, a portable, motor-propelled, hand-guided oxy-acetylene cutting machine for cutting steel plates and slabs in simple or intricate shapes over extended areas. Catalogue entitled "Oxy-acetylene Welding and Cutting Pressure Regulators and Regulation Problems."

Steel

UNION DRAWN STEEL CO., Massillon, Ohio. Circular entitled "A Valuable Steel Service," outlining the service offered by the company to aid manufacturers in selecting the correct grade of steel to suit their specific needs. The circular also gives examples showing the advantages of various cold-working processes in developing widely different characteristics in a common grade of steel such as Bessemer screw stock.

Gear-Cutting Machines

FELLOWS GEAR SHAPER CO., Springfield, Vt. Circular containing data on the original Fellows gear-shaper cutters for cutting external and internal spur gears. Pamphlet illustrating and describing the No. 4-S helical cutter sharpening machine for "normal" sharpened helical gear shaper cutters. The principle of operation of the machine is described and complete instructions are given for setting it up.

Heat-Treating Furnaces

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletin GEA-1924, describing the GE controlled-atmosphere electric furnaces and a few of their many applications. The booklet contains illustrations of typical installations of GE furnaces and furnace-atmosphere controllers for annealing or normalizing without oxidation, for hardening without scale, and for electric furnace brazing.

Strain Gages and Telemeters

BALDWIN-SOUTHWARK CORPORATION, Philadelphia, Pa. Bulletin 71, descriptive of the Whittemore strain gage for measuring stresses in metals. Bulletin 73, containing descriptions and prices of the McCollum-Peters electric telemeters. Oscillograph equipment, both standard and special, required for making records from electric telemeters is also described.

Diamond Wheels for Grinding Cemented Carbides

NORTON CO., Worcester, Mass. Circular containing the story of bortz (diamonds) in grinding wheels. The illustrations show the wheels of three different grain sizes regularly produced—a brown wheel for cemented-carbide tool-grinding jobs; a green wheel for lapping operations; and a buff wheel for finish-lapping. The available shapes are also listed.

Grinding Wheels

CARBORUNDUM CO., Niagara Falls, N. Y. Pamphlet entitled "A Treatise on the Dressing and Truing of Grinding Wheels," containing a description of wheel dressers; the general application of abrasive wheel type dressers; diamond recommendations for specific applications; and dressing and truing procedure for specific classes of grinding.

High-Tensile Steels

UNITED STATES STEEL CORPORATION, 71 Broadway, New York City. Leaflet on high-tensile steels for lighter weight construction and their use in transportation equipment. Catalogue containing data on the three grades of high-tensile steels—"Cor-ten," "Man-ten," and "Sil-ten"—particularly adapted for use in transportation fields.

Rebuilt Machine Tools

EASTERN MACHINERY CO., 3267 Spring Grove Ave., Cincinnati, Ohio. Machinery List No. 35, listing the rebuilt machine tools that this company has in stock, including arbor presses, bolt cutters, boring mills, drilling machines, gear cutters and hobbers, grinders, lathes, screw machines, milling machines, planers, presses, shapers, etc.

Developing Machines and Direct Printing Process Paper

CHARLES BRUNING CO., INC., 445 Plymouth Court, Chicago, Ill. Catalogue entitled "Black and White Magic," descriptive of the B-W black and white prints and the process by which they are produced. One section of the book also describes the developing machines made by this company.

Milling Machines

CINCINNATI MILLING MACHINE CO., Cincinnati, Ohio. Circular describing the outstanding features of the new Cincinnati No. 1-12 plain automatic milling machine, which is especially built for the low-cost milling of large- or medium-lot small-sized parts. Complete specifications are included.

Gears

PHILADELPHIA GEAR WORKS, Erie Ave. and G St., Philadelphia, Pa.

Catalogue covering the complete line of gears made by this concern. Tables of dimensions and prices are given for the various types of gears, and data on speed reducer units, MotoReducers, and electric hoists are included.

Iron and Steel

OLIVER BROS., INC., 200 Hudson St., New York City. Table of market values of the principal iron, steel, wire, and metal materials from December, 1897 to July, 1934, inclusive. The lowest and highest price of each material since 1897 are given in separate columns for comparative purposes.

Race Grinding Machines

LANDIS TOOL CO., Waynesboro, Pa. Catalogue G34, containing a complete description and large-scale detailed illustrations of the Landis internal and external hydraulic race grinders. Complete specifications for both the 3 1/2-inch internal and the 5-inch external machines are included.

Heat-Treating Furnaces

W. S. ROCKWELL CO., 50 Church St., New York City. Leaflet 349, outlining the advantages of the Rockwell continuous controlled atmosphere furnaces of the conveyor-belt type, which are suitable for annealing, silver soldering, copper brazing, and scaleless hardening.

Gear Lubricants

D. A. STUART & CO., Chicago, Ill. Bulletin 4, containing information on the development of Sturaco gear lubricant. The bulletin gives the results of comparative tests of various gear lubricants and explains the causes of premature wear of gears and bearings.

Chain Drives

LINK-BELT CO., 910 S. Michigan Ave., Chicago, Ill. Folder 1460, illustrating and describing Link-Belt 3/16-inch pitch silent chain drives. This little folder contains installation pictures and gives both horsepower and pitch diameter tables for these drives.

Ball and Roller Bearings

RAY M. RING CO., 9 S. Clinton St., Chicago, Ill. Loose-leaf catalogue containing complete listings of dimensions and prices for this company's line of products, which includes ball and roller bearings, V-belt drives, motor pulleys, and pivot motor bases.

Rubber-Tired Truck Wheels

B. F. GOODRICH CO., Akron, Ohio. Booklet on the new line of Goodrich Vulc-On rubber-tired wheels for industrial trucks. The booklet points out the advantages of these wheels, and gives data concerning comparative tests of rubber-tired and steel wheels.

Flexible Couplings

AJAX FLEXIBLE COUPLING CO., Westfield, N. Y. Catalogue covering the Ajax line of flexible couplings, which include heavy duty, medium duty, and light duty, shear-pin, and tension sleeve or quick-detachable couplings, as well as special couplings.

Welding Equipment

LINCOLN ELECTRIC CO., Cleveland, Ohio. Welder Specification Bulletin No. 303, giving general specifications for Lincoln "Shield Arc" welders, of the belted or direct-driven type, made in standard ratings of 300, 400, and 600 amperes.

Rust-Resisting Iron

REPUBLIC STEEL CORPORATION, Youngstown, Ohio. Bulletin No. ADV 132, entitled "Thumbs Down on Rust," explaining the reasons for the high rust resistance of Toncan iron and illustrating a number of typical installations.

Electric Motors

OHIO ELECTRIC MFG. CO., 5900 Maurice Ave., Cleveland, Ohio. Bulletin 208, containing data on Ohio ball-bearing slow-speed torque motors or rotating magnets. Duty specifications of these motors and tables of dimensions are included.

Steel

FIRTH-STERLING STEEL CO., McKeesport, Pa. Bulletins describing the characteristics, applications, and heat-treatment of Firth-Sterling "Blue Chip" high-speed steel; "Circle C" super high-speed steel; and Sterling stainless steels.

Bearing Bronze

ALUMINUM INDUSTRIES, INC., Cincinnati, Ohio. Leaflet containing information on Permite leaded phosphor-bronze bars, which are now available in standard 6-foot lengths.

Diesel Engines

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Bulletin describing the features of construction, sizes, and fields of application of Worthington Type B vertical four-cycle Diesel engines.

Grinding Machines

WILLIAMS, WHITE & CO., Moline, Ill. Circular illustrating and describing the new Osterholm horizontal grinder, which is designed to accommodate different types of work without elaborate fixtures.

Welding Equipment

ASSOCIATED PATTERN & MFG. CO., Los Angeles, Calif. Circular illustrating and describing the Imperial alternating-current arc welder designed to give instant amperage control.

Shaftless Motors

LOUIS ALLIS CO., Milwaukee, Wis. Bulletin 516, outlining the many advantages and economies obtainable with shaftless motors for driving modern production machinery.

Electric Furnaces

HEVI DUTY ELECTRIC CO., Milwaukee, Wis. Bulletin HD-934, illustrating and describing box type air-draw furnaces, with motor-driven fan, for tempering and annealing.

Electrically Welded Tubing

STEEL & TUBES, INC., 224 E. 131st St., Cleveland, Ohio. Circulars outlining the advantages of Electrunite boiler tubes and Electrunite mechanical tubing.

Pressure Recording Instruments

ESTERLINE-ANGUS CO., Indianapolis, Ind. Bulletin 834, descriptive of pressure recording instruments, including pressure relays and telemeters.

Materials-Handling Equipment

CLEVELAND CRANE & ENGINEERING CO., Wickliffe, Ohio. Leaflet G-334, illustrating typical examples of Cleveland tramrail switches in service.

Electric Motors

BODINE ELECTRIC CO., Chicago, Ill. Catalogue Section 2040, illustrating and describing Bodine single-phase, direct-current, governor-controlled motors.

NEWS OF THE INDUSTRY

England

MAX RACHWALSKY, of the E. H. Jones Machinery Co., London, England, has returned to Europe from a business trip in the United States which he designated as most successful. He has secured the representation in Great Britain of a number of important American machine tool manufacturers.

Illinois and Wisconsin

INDEPENDENT PNEUMATIC TOOL CO., Chicago, Ill., announces that at a recent meeting of the board of directors, W. A. NUGENT was elected vice-president in charge of sales and NEIL C. HURLEY, JR., was elected secretary. Mr. Nugent has been with the company for twenty years, serving in various executive capacities, most recently as sales manager. Mr. Hurley has been in charge of the distribution of the company's electric tools.

WROUGHT WASHER MFG. CO., Milwaukee, Wis., announces that it has added to its regular line a list of washers especially adapted to the aviation industry. These washers can be furnished in any of the materials officially specified by the Government for this type of requirement and they are available for quick delivery.

Michigan

WHITMAN & BARNES, INC., Detroit, Mich., has just completed the moving of the Carpenter Division of the company from Pawtucket, R. I., to Detroit, where a newly equipped tap and die factory has been established at 2108 W. Fort St. William Dalzen, formerly associated with the Michigan Tool Co. and the Detroit Tap Co., will be factory manager in charge of the new plant. Herbert Heath, of the Carpenter Tap & Die Co., will remain vice-president and sales manager. He was formerly factory manager of the Carpenter Division in Pawtucket. The plant is now in full operation, manufacturing the entire line of Carpenter tools, consisting of carbon steel taps and dies, and ground-thread high-speed steel taps, as well as thread-rolling dies, lead-screws, and chaser blades.

ARNOLD LENZ, assistant manufacturing manager with the Chevrolet Motor Co., was awarded the Whiting medal for his noteworthy contributions to the foundry industry, at the annual convention of the American Foundrymen's Association in Philadelphia, Pa. Mr. Lenz was born in Hauingen, Germany, in 1888, and after having learned his trade in Germany, he came to America in 1906. He is a practical foundryman, having worked as molder, core-maker and melter, until he became superintendent of the General Motors Corporation's gray iron foundry in Saginaw, Mich. He received the honorary degree of Doctor of Engineering from the University of Aachen, Germany, in 1933.

W. H. GRAVES, chief metallurgist of the Packard Motor Car Co., Detroit, Mich., has been appointed vice-chairman of the Committee on Die-Cast Metals and Alloys of the American Society for Testing Materials.

REVERE COPPER & BRASS, INC., Detroit, Mich., announces the opening of an office at 922 Grand Rapids National Bank Bldg., Grand Rapids, Mich. David T. Applebee is district manager of the new office.

CLAUDE A. STEADMAN has become associated with the Pioneer Engineering & Mfg. Co., Inc., 8316 Woodward Ave., Detroit, Mich., designer of tools, dies, gages, and special machinery.

New England

VICTOR G. VAUGHAN has become manager of the Spencer Thermostat Co., Attleboro, Mass. He will have charge of all operations, including the development of new products. Mr. Vaughan was until recently manager of the Appliance Engineering Division of the Westinghouse Electric & Mfg. Co. He was born in San Antonio, Texas, in 1894, and is a graduate of the Georgia School of Technology. Since his graduation, most of his engineering experience has been with the Westinghouse Company. He holds some forty patents on appliances and equipment in his chosen field.

E. W. LAWRENCE has been appointed southern representative of the Norma-Hoffmann Bearings Corporation, Stamford, Conn., manufacturer of precision ball and roller bearings. Mr. Lawrence has been connected with the New York sales office of the company for the last eleven years.

New Jersey and Pennsylvania

KINGSTON-CONLEY ELECTRIC CO., 66 York St., Jersey City, N. J., has been established to engage in the manufacture of fractional-horsepower heavy-duty motors. F. S. KINGSTON, formerly superintendent of the small motor department of the Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., is president, and B. L. CONLEY, previously electrical engineer with the Hoover Co., North Canton, Ohio, is vice-president and treasurer.

HYATT ROLLER BEARING CO., Harrison, N. J., announces that eight of the high-speed streamline cars being built by the American Car & Foundry Co. for the Baltimore & Ohio Railway will be equipped with Hyatt roller-bearing journal boxes.

W. R. SHIMER, metallurgical engineer of the Bethlehem Steel Co., Bethlehem, Pa., has been appointed vice-chairman of the Committee on Ferro-Alloys of the American Society for Testing Materials.

New York

SHEPARD NILES CRANE & HOIST CORPORATION announces that all its manufacturing divisions are now concentrated at Montour Falls, N. Y. The Niles plant in Philadelphia has been closed and its equipment moved to Montour Falls. A new erecting shop especially designed for the manufacture of Niles heavy cranes has been built. All the engineering data, fixtures, and tools formerly used by the General Electric Co. in building the Shepard motor have been purchased and the Shepard and Niles motors are now being produced at Montour Falls. The Chemung Foundry in Elmira, N. Y., which produces all the iron castings for the company, is now the only division not located at Montour Falls.

HAROLD SMITH has been elected vice-president of the Westinghouse Electric International Co., with headquarters at 30 Rockefeller Plaza, New York City. His new duties will be additional to those of his position as vice-president of the Westinghouse Electric & Mfg. Co.

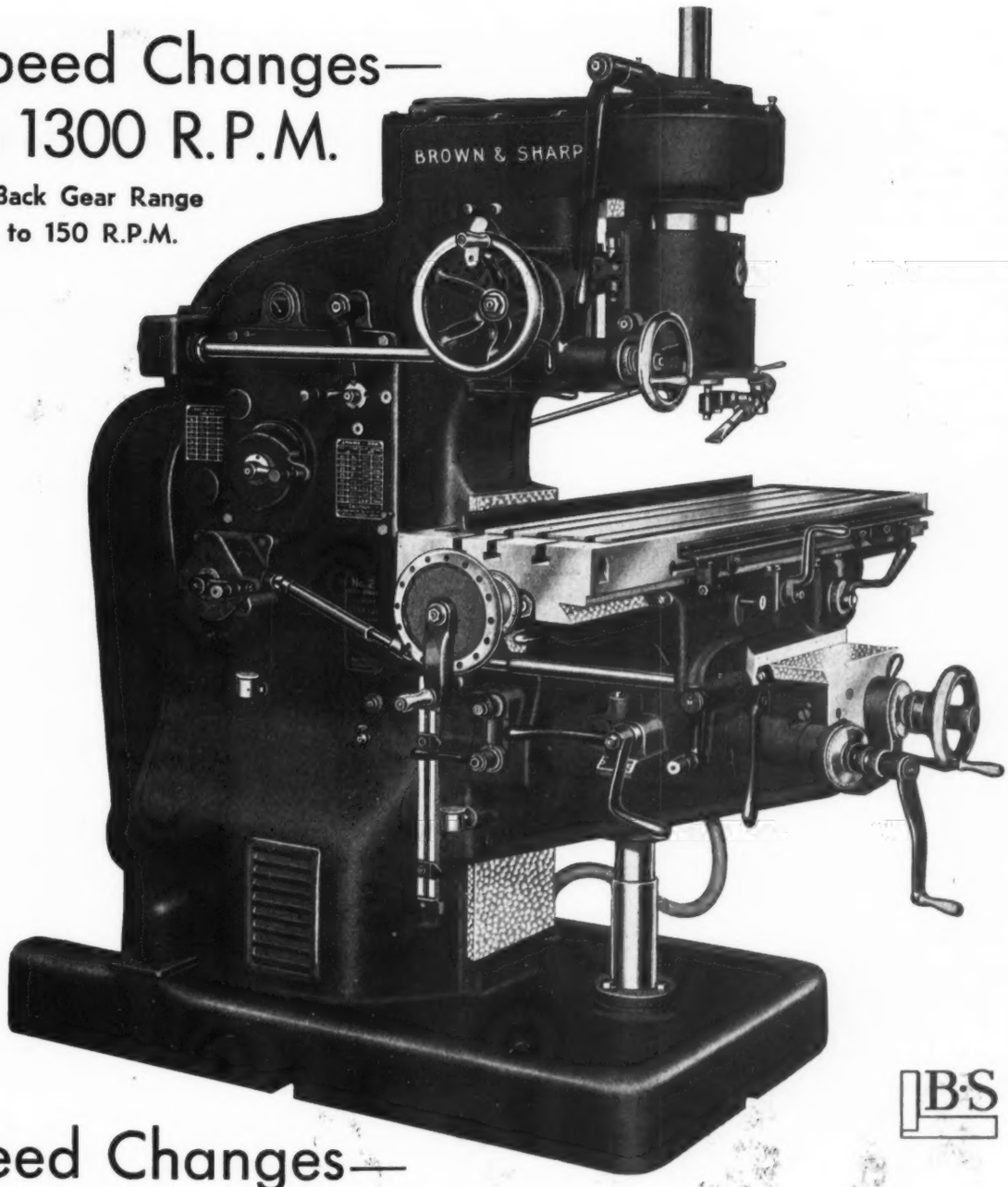
L. B. PROSNITZ, of L. B. Prosnitz & Co., 521 Fifth Ave., New York City, delivered an address on the "Future of the Trade Association" before a recent meeting of the Special Tool, Die, and Machine Shop Institute at the Hotel Pennsylvania.

THOMAS PROSSER & SON, 15 Gold St., New York City, manufacturers and United States distributors of Widia cemented-carbide tools, announce the following changes in their sales organization: J. J. CONNELL, 4717 Malden Ave., Chicago, Ill., has been appointed representative covering the states of Illinois and Iowa; W. D. BRIGGS, P. O. Box 315, Portland, Ind., is covering the state of Indiana; and G. M. MENCKE, 704 Race St., Cincinnati, Ohio, is covering southern Ohio and the state of Kentucky.

E. D. SPICER has been appointed manager of the General Electric Co.'s Schenectady Works, succeeding BERTON L. DELACK, who has retired because of im-

32 Speed Changes—
20 to 1300 R.P.M.

Broadened Back Gear Range
16 Changes to 150 R.P.M.



B·S

32 Feed Changes—
7/16" to 62" per minute—**Controlled from front or rear**

Ask for detailed specifications showing advanced features of design

Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

The New BROWN & SHARPE No. 2 HIGH SPEED VERTICAL SPINDLE MILLING MACHINE

paired health. Mr. Spicer was previously assistant works manager. He has been connected with the General Electric organization since 1924.

J. J. CROWE, engineer in charge of apparatus research and development of the Air Reduction Sales Co., New York City, has been appointed secretary of the Committee on Ferro-Alloys of the American Society for Testing Materials.

W. H. ROTHER, metallurgist of the Buffalo Foundry & Machine Co., Buffalo, N. Y., has been appointed vice-chairman of the Committee on Cast Iron of the American Society for Testing Materials.

CHARLES MCKNIGHT of the International Nickel Co., Inc., New York City, has been appointed chairman of the Committee on Ferro-Alloys of the American Society for Testing Materials.

Ohio

GEARS & FORGINGS, INC., Cleveland, Ohio, which has been in receivership since April 1, 1932, has been reorganized under the name of the OHIO FORGE & MACHINE CORPORATION. The new company will operate the former Ohio Forge and Van Dorn & Dutton Divisions of Gears & Forgings, Inc., located on adjoining properties at Cleveland. The officers who will direct the new company are: Chairman of the board, F. H. Chapin, president of the National Acme Co.; president, S. C. Dalbey, of the Ohio Forge Co.; vice-president, J. M. Clem, also of the Ohio Forge Co.; executive vice-president, H. B. Newell, formerly vice-president in charge of operations of Gears & Forgings, Inc.; secretary and treasurer, T. E. Leighton, of the originai Van Dorn & Dutton Co.; general sales manager, R. B. Tripp, formerly general sales manager of Gears & Forgings, Inc. The standard line of speed reducers formerly marketed under the G & F trademark will continue to be manufactured in the Cleveland plants.

D. M. WILHELM, who has been sales manager of the Patterson Foundry & Machine Co., East Liverpool, Ohio, for the last four years, has been elected secretary of the company. He will be succeeded as sales manager by E. M. UNDERWOOD, formerly division sales manager at East Liverpool. Mr. Wilhelm graduated from the Carnegie Institute of Technology in 1923 and, for several years, was plant engineer at the Springdale power plant of the West Penn Electric Co. at New Kensington, Pa. He joined the Patterson company in 1927.

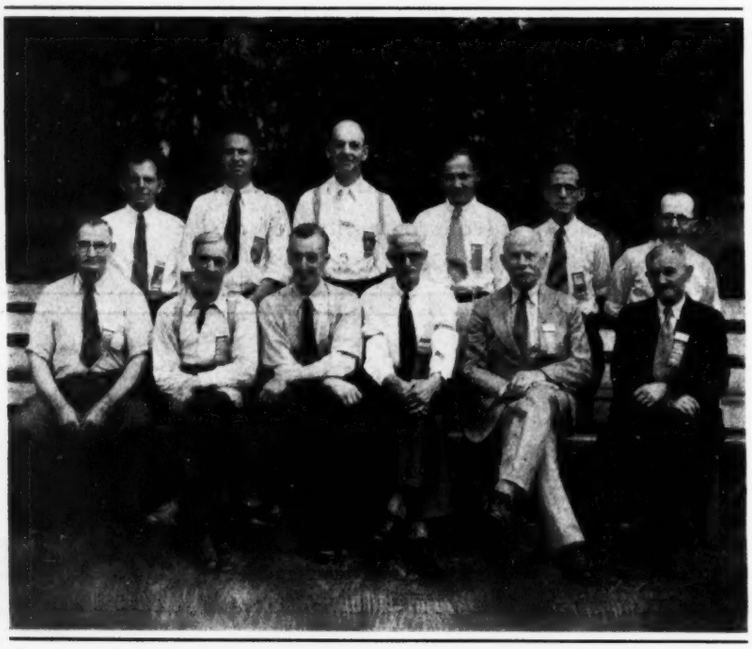
TYSON ROLLER BEARING CORPORATION, Massillon, Ohio, announces the following additions to its engineering and sales organization personnel. ROBERT W. BALLENTINE has been appointed district manager, with headquarters in Milwaukee, Wis. HYMAN LEDEEN has been made district manager, with offices in San Francisco and Los Angeles, Calif. BEN L. CREW, JR., sales engineer, has been assigned to the Detroit offices. E. L. FARNSWORTH has been appointed service sales representative, with offices in New York City.

FRANK D. LAKE AND ASSOCIATES, 3024 Cherry St., Toledo, Ohio, have been appointed exclusive agents by the BRYANT MACHINERY & ENGINEERING CO., 400 W. Madison St., Chicago, Ill., for the following lines of machine tools: Ohio shapers; Dreses radial drills; Ohio horizontal boring, drilling, and milling machines; Boye & Emmes engine lathes; Cleereman heavy-duty drilling machines; and Kling heavy-duty grinders.

John C. Lincoln, Honored for his Contributions to the Art of Electric Welding

JOHN CROMWELL LINCOLN, chairman of the board of the Lincoln Electric Co., Cleveland, Ohio, has been awarded the Samuel Wylie Miller Medal by the American Welding Society, in recognition of his great contributions to the advancement of the science of electric fusion welding. As one of the early pioneers of arc welding, Mr. Lincoln has devoted most of his life to research and development of the electric arc as an industrial tool. As a result, the industry has achieved a remarkable growth during the last quarter century.

JOHN CHRISTENSEN, president of the Cincinnati Gear Co., Cincinnati, Ohio, and president of the American Gear Manufacturers Association, who has just returned from a visit abroad, brought to the convention of the Gear Manufacturers held in Milwaukee, Wis., October



Everyone in this group of men has been with the Watervliet Plant of the Ludlum Steel Co. twenty-five years or more. Left to right in the front row, they are: William H. White, James Decker, Albert Doremus, James L. Black, Frank S. Quick, Oscar Hill. Left to right in the rear row: William Cherney, Anthony Passafaro, Theodore S. Robinson, John Dorman, Tito Mori, and John Cherney.